An independent magazine published by ECC Publications

September 1983

sinclair user

NEW THIS MONTH — SOFTWARE DIRECTORY

140 pages for only 75p

Issue No 18

FREE OFFER IDEAL FOR NEW USERS

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ZX-81 HELPS TOP PENTATHLETE — User of the month

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Take a 3D look at games

LAST CHANCE TO WIN A PROGRAMMING FORTUNE

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Editor
Nigel Clark

Consultant editor
Mike Johnston

Production editor
Harold Mayes MBE

Staff writer
John Gilbert

Program reviewer
Rebecca Ferguson

Illustrator/Designer
Brian King

Editorial director
John Sterlicchi

Advertisement manager
John Ross

Sales executive
Annette Burrows

Editorial assistant
Margaret Hawkins

Production assistant
Dezi Epaminondou

Managing director
Terry Cartwright

Chairman
Richard Hease

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Telephone
All departments
01-359 3525

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London N1 4AQ

Programs should be on cassette and articles should be typed. We cannot undertake to return them unless a stamped-addressed envelope is included.
We pay £10 for the copyright of each program published and £50 per 1,000 words for each article used.

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☐ **135 SOFTWARE DIRECTORY** This month we begin a new service to readers, a complete list of commercial software for Sinclair machines. The first part is published this month and the rest will follow. It will form a regular feature in the months which follow.

NEXT MONTH

A special voucher which can be exchanged at Rumbelows is one of the many offers in the October issue of *Sinclair User*, plus the second half of the Software Directory.

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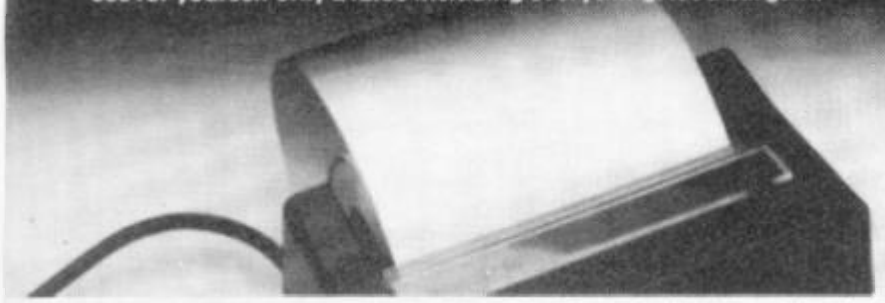

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End of mail order in sight?

AT LAST, the long-awaited Microdrives have arrived and that is official. We, the privileged members of the Press, have been introduced to one by Sir Clive. We had to be introduced because the finished article was not exactly what we expected from the earlier descriptions and the pictures which were shown in advertisements until only recently.

As seemed almost inevitable, it has aroused mixed reactions, many no doubt having had their expectations raised by the wait of more than a year since the 'revolutionary' storage system was announced. It will take some months, however, before a true assessment can be made of its worth and whether a decision to buy the Spectrum on the basis of the Microdrive was justified.

One difficulty which has already arisen is the possible non-compatibility with the Micronet 800 adaptor. That will limit the amount of information which can be downloaded from the Micronet system at any time.

With the time it has taken to get the two major developments in the Sinclair market this year off the ground it should have been possible to find compatible areas in which they could be attached to the Spectrum. Both will result in a large expansion of the uses of the Spectrum on their own but together the possibilities would have been multiplied.

It is a good idea for a company to keep its latest developments secret so that competitors do not have the opportunity to close the gap on its technical advances. It is not a good idea to keep associates so much in the dark that clashes of this kind occur.

On the more positive side, the Microdrive ROM which removes the bugs on the original Spectrum ROM and also allowed users to write their own versions of Basic are to be welcomed.

While the appearance of the Microdrive is a major event in the Sinclair year, it is likely that other developments in the last month will have a more lasting and important effect on the market.

The Microdrive is another addition to the growing list of improvements and expansions available to the users of home computers but the new ideas in other areas mark a major shift away from the traditional market base.

Since Sinclair Research began selling its first computer by mail order, that has been the traditional distribution channel for both software and hardware. A few specialist shops opened to begin the move towards over-the-counter sales and W H Smith gave that a big boost slightly more than 18 months ago when it began selling the ZX-81 in selected branches.

Other retailers, however, have been slow to show their enthusiasm for expanding the retail outlets, possibly because their experiences with machines other than Sinclair did not encourage them.

Two developments from Prism Micro Products are likely to ensure that retail outlets begin to expand rapidly. Prism is a sister company of ECC Publications, which publishes *Sinclair User,* but we make no excuse for considering that the company plans could lead to a revolution in home computing.

The rack-jobbing system and the Romox cartridge terminals are detailed in the news pages. Both will have the effect of making software much more easily available to the consumer and thus put home computing on the way to becoming a major leisure interest.

As shown in the recent Economic Intelligence Unit report, the United Kingdom has by far the biggest market for home computers in Europe. Easier access to software and hardware will make sure the U.K. maintains that position.

Both systems take many of the difficulties of selling software away from retailers. In the rack-jobbing system the retailer has only to be sure that sales will be sufficient to cover the costs of providing selling space. Decisions about which lines to stock and which to cease to stock will be taken out of their hands.

The Romox system will have similar benefits, with the added advantage that decisions by software houses about which programs to publish are made less crucial. New lines can be transmitted to the terminals and it can then be left to the consumers which they wish to buy, giving them a greater choice. It will also reduce the security problems of holding large amounts of valuable programmed cassettes.

As the recent theft of machines from Prism showed, thieves are beginning to appreciate the value of goods in the home computer market.

As stated here in previous months it is moves like these which are needed if home computing is to become as popular a leisure pursuit as photography or video.

A result of these changes will be that mail order will no longer be an important feature of the market. It will no doubt be retained by the smaller companies with confidence in their

products but for the most part sales will be through retailers with a distribution agreement with one of the growing number of distributors.

Another point made in previous issues is that the market appears to be following the example of the record industry, with software companies turning away from writing their own programs and marketing those of others. A more accurate blue-print would appear to be that of book publishing. That suggestion has been reinforced both by the Prism moves and the establishment of the first agent for software writers.

Neil Gibson and Co is offering to assess programs and arrange the best deal with a software house. The software house will then deal with marketing, having an agreement with a distribution company which will then deal with the retailers.

All that should be good news to enthusiasts who live outside the main population areas who have had to suffer the vagaries of mail order without having the opportunity to see what the games look like before buying. London has been well-served with shows at which most of the software producers have shown their products and the north has been similarly well-served with shows at Manchester and Leeds. People in Wales and Scotland, however, have had either to travel long distances or to trust to small retail outlets.

For Scottish enthusuiasts that should change in September when the first large ZX show is being staged near Edinburgh. *Sinclair User* will be taking the roadshow there with its advice stand and displays of games from the magazines and others should be able to provide a good day for the Sinclair-starved people north of the border.

Which Company...

. . . . has had all its games in the Top Charts.

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4 The best and most original game seen for the Spectrum . . . . *Sinclair User*

5 Another 3D Winner *Sinclair User*

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7 The most outstanding thing you'll see for a long time . . . . one of the most beautiful graphically to be seen on the Spectrum *P.C.W.*

8 If I had to choose one programme to impress an audience with the capabilities for the ZX81, 3D Monster Maze would be the one . . . . *Z.X. Computing*

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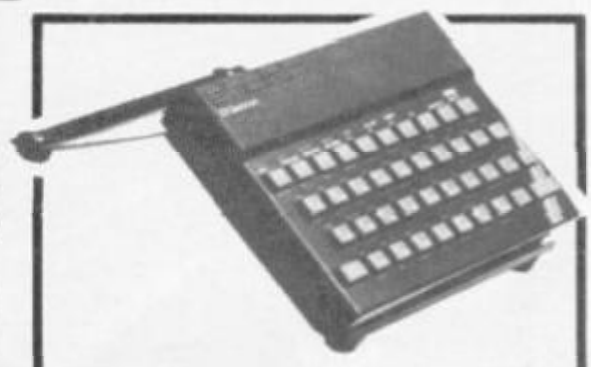

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People join from all over the world

Membership passes 1,000

THE SINCLAIR User Club is continuing to grow steadily. More than 1,000 members have joined although the Club has only been running for less than 10 months.

Club membership started in Britain but soon readers of *Sinclair User* in other countries began to send registration forms. The Club now has members in Zimbabwe, the Netherlands and as far away as India.

Members are quick to accept the offers which are made through the Club pages. More than 30 orders were made for the RD Digital Tracer since it was offered in May. The device was marked down from £49.95 to £45.

The Club offers members a wide variety of good-quality products and in the past it has offered software from Quicksilva, R and R Software, and PSS. Offers have not been limited only to software. Hardware, such as the Hilderbay loading aid, has sold well through the Club.

The telephone helpline is another service which is for all members. If you have a problem with a program or a query about your machine you can use the telephone for a quick answer. The telephone number is included on the Club cassette newsletter which is sent to all members once every two months. It provides programs and information of interest to all Sinclair users.

The Club offers announced this month are open only to members. Those who would like to join can also take advantage of the offers by including orders on the registration form. The offers are available until the end of September.

Discount on games for both machines

WE CONCENTRATE on games for our special offer to club members this month. With a discount of 20 percent there are real savings on cassettes which have proved popular for many months.

There are four games in all, two for the ZX-81 and two for the Spectrum. ZX-81 owners can make savings on the ingenious **3D Monster Maze** from New Generation Software, the first three-dimensional game for any Sinclair computer, and on the Quicksilva **Defenda.**

The Spectrum games are both from the small new software house Quest Micro Software. They are the interesting space adventure games **Black Hole** and **Violent Universe.**

Full details of the games and their usual and offer prices are shown below. Members should avail themselves of the offers in the usual way by sending orders and membership cards to the relevant suppliers.

Quicksilva is at Palmerston Park House, 13 Palmerston Road, Southampton.

New Generation Software is at 16 Brendan Close, Oldland Common, Bristol.

Quest Micro Software is at 119 The Promenade, Cheltenham, Gloucestershire .

As usual, the offer is open only to members of the biggest club in Britain for users of Sinclair machines and will be available until the end of September. To help new members to take immediate advantage of the savings this month, they should include their order with their membership application.

	Usual price	Offer price
ZX-81		
Quicksilva		
Defenda	**£3.95**	**£3.15**
New Generation Software		
3D Monster Maze	**£4.95**	**£3.95**
Spectrum		
Black Hole	**£5.50**	**£4.40**
Violent Universe	**£5.50**	**£4.40**

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Sinclair User Club

Britain

Aylesbury ZX Computer Club: Ken Knight, 22 Mount Street, Aylesbury (5181 or 630867). Meetings: first Wednesday and third Thursday of the month.

Basildon Microcomputer Club: Roger Sims, Wickford 63032, after 6.30pm. Meetings every other week on Tuesdays from 7.30 to 10pm at Healey Management Services, The Hemmels, Laindon, Essex.

Bristol Yate and Sodbury Computer Club: 99 Woodchester Yate, Bristol, BS17 4TX.

Colchester Sinclair User Group: Richard Lown, 102 Prettygate Road, Colchester CO3 4EE.

Doncaster and District Micro Club: John Woods, 60 Dundas Road, Wheatley, Doncaster DN2 4DR; (0302) 29357. Meetings held on second and fourth Wednesday of each month.

Eastwood Town Microcomputer Club: E N Ryan, 15 Queens Square, Eastwood, Nottingham NG16 3BJ.

Edinburgh: Edinburgh Home Computing Club. John Palmer (031 661 3183) or Iain Robertson (031 441 2361).

EZUG-Educational ZX-80–81 Users' Group: Eric Deeson, Highgate School, Birmingham B12 9DS.

Furness Computer Club: R J C Wade, 67 Sands Road, Ulverston, Cumbria (Ulverton 55068). Meets every other week on Wednesday evenings.

Glasgow ZX-80–81 Users' Club: Ian Watt, 107 Greenwood Road, Clarkston, Glasgow G76 7LW (041 638 1241). Meetings: second and fourth Monday of each month.

Gravesend Computer Club: c/o The Extra Tuition Centre, 39 The Terrace, Gravesend, Kent DA12 2BA. Bi-monthly magazine and membership card.

Hassocks ZX Micro User Club, Sussex: Paul King (Hassocks 4530).

Inverclyde ZX-81 Users' Club: Robert Watt, 9 St. John's Road, Gourock, Renfrewshire PA19 1PL (Gourock 39967). Meetings: Every other week on Monday at Greenock Society of the Deaf, Kelly Street, Greenock.

Keighley Computer Club: Colin Price, Redholt, Ingrow, Keighley (603133).

Lambeth Computer Club: Robert Barker, 54 Brixton Road, London SW9 6BS.

Liverpool ZX-Computer Centre: Keith Archer, 17 Sweeting Street, Liverpool 2.

Merseyside Co-op ZX Users' Group: Keith Driscoll, 53 Melville Road, Bootle, Merseyside L20 6NE; 051-922 3163.

Micro Users' Group: 316 Kingston Road, Ewell, Epsom, Surrey KT19 0SY.

Newcastle (Staffs) Computer Club: Meetings at Newcastle Youth and Adult Centre, Thursday, 7.30 to 10 pm. Further information from R G Martin (0782 62065).

North Hertfordshire Home Computer Club: R Crutchfield, 2 Durham Road, Stevenage; Meetings: first Friday of the month at the Settlement, Nevells Road, Letchworth.

Northern Ireland Sinclair Users' Club: P Gibson, 11 Fitzjames Park, Newtownards, Co Down BT23 4BU.

North London Hobby Computer Club: ZX users' group meets at North London Polytechnic, Holloway Road, London N7 each Monday, 6pm.

Nottingham Microcomputer Club: ZX-80–81 users' group, G E Basford, 9 Holme Close, The Pastures, Woodborough, Nottingham.

Orpington Computer Club: Roger Pyatt, 23 Arundel Drive, Orpington, Kent (Orpington 20281).

Perth and District Amateur Computer Society: Alastair MacPherson, 154 Oakbank Road, Perth PH1 1HA (29633). Meetings: third Tuesday of each month at Hunters Lodge Motel, Bankfoot.

Regis Amateur Microcomputer Society: R H Wallis, 22 Mallard Crescent, Pagham, Bognor Regis, West Sussex PO21 4UU.

Scunthorpe ZX Club: C P Hazleton, 26 Rilestone Place, Bottesford, Scunthorpe; (0724 63466).

Sheffield: South Yorkshire Personal Computing Group. Enquiries to R Alderton (0742 20571), S Gray (0742 351440), P Sanderson (0742 351895).

Sittingbourne: Anurag Vidyarth (0795 73149). Would be interested to hear from anyone who wants to start a club near the Medway towns.

Stratford-on-Avon ZX Users' Group: Chris Parry, 16 Sackville Close, Stratford-on-Avon, Warwickshire.

Swansea Computer Club: B J Candy, Jr Gorlau, Killay, Swansea (203811).

Swindon ZX Computer Club: Andrew Bartlett, 47 Grosvenor Road, Swindon, Wilts SN1 4LT; (0793) 3077. Monthly meetings and library.

Sutton: Sutton Library Computer Club, D Wilkins, 22 Chestnut Court, Mulgrave Road, Sutton, Surrey SM2 6LR.

West Sussex: Midhurst and District Computer User Group. Enquiries to V Weston (073 081 3876), R Armes (073 081 3279).

Worle Computer Club: S W Rabone, 18 Castle Road, Worle, Weston-super-Mare BS22 9JW (Weston-super-Mare 513068). Meetings: Woodsprings Inn, Worle, on alternate Mondays.

ZX-Aid: Conrad Roe, 25 Cherry Tree Avenue, Walsall WS5 4LH. Please include sae. Meetings twice monthly.

ZX Guaranteed: G A Bobker, 29 Chadderton Drive, Unsworthy, Bury, Lancashire. Exchanges information and programs throughout the country.

ZX-80/ZX-81 Users' Club: PO Box 159, Kingston-on-Thames. A postal club.

Overseas

Belgium: ASBL BDMA Belgium National Sinclair Club; P Glenisson, Rue De l'Epeestraat, 14, 1200 Bruxelles.

Belgium, France and Luxembourg: Club Sinclair, Raymong Betz, 38 Chemin du Moulin 38, B-1328 Ohain, Belgium (322 6537468).

Belgian User Group for Sinclair owners (BUGS); Op de Beeck, Patrick, Drabstraat 144, 2510 Mortsel.

Micro-Europe Club; R Betz, Chemin du Moulin, B1328, Ohain, Belgium. Telephone: CCP 000 0846556–37.

Denmark: Danmarks National ZX-8081 Klub (DNZK), Jens Larson, Skovmosevej 6.4200 Slagelese, post giro 1 46 24 66.

ZZ-Brugergruppen i Danmark, Boks 44, 2650 Hvidovre, Gratis medlemskab og gratis blad til enhver interesseret.

J Niels-Erik Hartmann, OZ-ZX-Radioamator, Bruger Gruppe, Bredgade 25 DK-4900, Nakskov.

East Netherlands: Jonathon Meyer, Van Spaen Straat 22,6524 H.N. Nijmegen; (080 223411).

Germany: ZX-80 Club, a postal club; contact Thomas Jencyzyk. Hameln, Postfach 65 D-3250 Hameln, Germany.

Indonesia: Jakarta ZX-80/81 Users' Club, J S Wijaya, PO Box 20, Jkukg, Jakarta, Utara, Indonesia.

Irish Amateur Computer Club: Martin Stapleton, 48 Seacourt, Clontarf, Dublin 3. (331304).

Italy: Sinclair Club, Vie Molimo Veccho so/F, 40026 Imola, Italy.

Genova Sinclair Club; Vittorio Gioia, Via F Corridoni, 2-1, telephone 010 3125 51.

Micro-Europe: Belgium or Club Paris-Micro, 19 Rue de Tilly, 92700, Colombes, France; associated with Club Micro-Europe.

Republic of Ireland: Irish ZX-8081 Users' Club, 73 Cnoc Crionain, Baile Atha, Cliath 1.

Singapore: Sinclair Users' Group: Eric Mortimer, 1D Wilmer Court, Leonie Hill Road, Singapore.

South Africa: Johannesburg ZX-80–81 Computer Users' Club: S Lucas, c/o Hoechst SA (Pty) Ltd, PO Box 8692, Johannesburg.

Johannesburg ZX Users' Club: Lennert E R Fisher, PO Box 61446, Marshallstown, Johannesburg.

Spain: Club Nacional de Usuarios del ZX-81, Joseph-Oriol Tomas, Avda. de Madrid, No 203 207, 10, 3a esc. A Barcelona-14 Espana. International ZX Spectrum Club: Gabriel Indalecio Cano, Sardana, 4 atrico 2a, San Andres de la Barca, Barcelona. Send international reply coupon. Produces a bi-monthly magazine. Spanish ZX Micro Club: Apartado 181, Alicante (Costa Blanca), Spain.

ZX Club Spain; C Benito PO Box 3253, Madrid, Spain.

Swedish ZX-club: Sinclair Datorklubben, Box 1007, S–122, 22 Enskede, Sweden.

United States: Bay Area ZX-80 User Group, 2660 Las Aromas, Oakland CA94611.—Harvard Group, Bolton Road, Harvard MA 01451: (617 456 3967).

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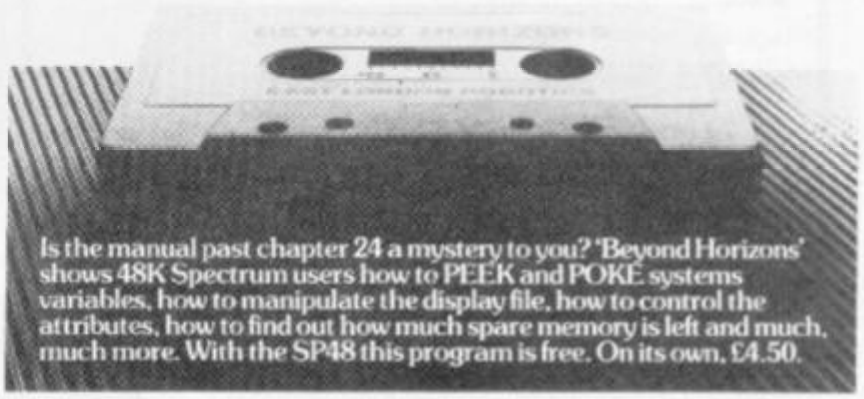

Is the manual past chapter 24 a mystery to you? 'Beyond Horizons' shows 48K Spectrum users how to PEEK and POKE systems variables, how to manipulate the display file, how to control the attributes, how to find out how much spare memory is left and much, much more. With the SP48 this program is free. On its own, £4.50.

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Arcades come top in PSS

THE WINNING programs in the PSS programming competition are all arcade games. The competiton was to design a program using the PSS MCoder compiler for the ZX-81 or Spectrum. All the prizes were given for Spectrum programs.

First prize was £500, won by Stan Cartwright of Cardiff. It was for a program called **Elektro Storm.** The second prize of £250 went to Chris Woods of Chessington, Surrey for a program called **Panic.**

The winning program may be marketed by PSS at the end of this year.

Scots get first big exhibition

THE FIRST BIG Scottish microcomputer show is to be held at Brunton Hall, Musselburgh, on Saturday, September 17.

Jill Donnachie, the organiser, says: "The ZX Club has put on a show previously but it was very small. This will feature all the big names.

"We have tried to get as many small computer companies as big ones to take stands. We also have a number of software companies booked and we are looking for more hardware manufacturers to take stands."

The Sinclair User Road Show will be at the show. An advice stand and display of the games from recent issues of *Sinclair User* and *Sinclair Programs* will be there, together with the latest issues of the magazines.

The Sixth Personal Computer World Show is to be held at the Barbican Centre, London from September 28 to October 2.

Some surprises in the Microdrive

THE MICRODRIVE for the Spectrum has finally been introduced, more than a year after it was first announced. The specifications of the final version bear a close resemblance to those given originally with the addition of the interface.

The expansion module is a black sloping box which fits under the Spectrum and can take up to eight drives. It will cost £49.95 but only £29.95 if bought with a microdrive, each of which will cost £49.95. Each of the drives has a capacity for at leaast 85K, so the total on-line memory capacity is approximately 700K.

NIGEL SEARLE "Praying for the success of the Microdrive."

The Microdrives are controlled by an 8K ROM, the software for which was designed by Dr Ian Logan.

As well as giving control over the drives, the ROM will allow an extended command mode which will enable users to add commands to Sinclair Basic. The extra commands would then be available with the rest of the Basic commands when the expansion module is in place.

The 8K ROM will also correct bugs in the Basic and operating system of the Spectrum by over-writing the errors while it is in operation.

The expansion module allows information to be accessed from the tape drives in three seconds. That is slightly better than the original Sinclair specification, which gives 3.5 seconds as the access time for 16K of memory.

At first the company will be offering the Microdrives exclusively through mail order to the first 1,000 people who bought the Spectrum by mail order last year. In that way the company hopes to compensate for the long wait experienced by some of its customers in the past.

It will later be offered to other owners who bought their Spectrums by mail order in strict sequence until that demand had been satisfied. Nigel Searle, managing director, said that he did not know when the drives would go on retail sale as that would depend on the demand and the amount by which production could be increased.

Best in Europe

THE U.K. leads Europe in the sales of microcomputers but West Germany is expected to dominate the market in the next five years. That is the view of the Economic Intelligence Unit, following a review of sales in the major markets of the U.K., Germany and France.

It says the U.K. led by a wide margin in all categories of micros, workstations costing between £3,000 and £10,000, personal computers costing between £500 and £3,000, and home computers costing less than £500 in 1982. It believes, however, that West Germany will soon lead in terms of value, because of the rapid increase in sales of the most expensive workstations.

In 1982, comparative sales showed that sales of workstations in Germany were worth £60.7 million compared to £60 million in Britain and £31 million in France.

The part of the market in which Britain is not threatened is the home computer market. Britain had sales of £94 million last year, going mainly to Sinclair Research, whereas Germany had sales of £28 million.

Learning move

A NEW RANGE of educational software for the Spectrum is to be launched jointly by Sinclair Research and Macmillan, publisher of educational books.

The software will be aimed specifically at the five-to-11-year-old age range and will be the first range of software to be designed for use both in the home and at school.

The programs will be designed for use either on their own or along with the Macmillan publications from which they are derived. The first batch of cassettes will appear in a month and more titles will be added in 1984.

Free aid for programmers

A MARKETING company, Neil Gibson and Co, is prepared to offer free help to microcomputer programmers who are trying to market their products.

John Courage, who owns the company, spoke of what he called "blatant dishonesty" by software houses to programmers who offer programs.

The company initially will deal with software for any Sinclair machine. It will offer programmers free appraisal and suggestions for improving commercial appeal.

When a software package is ready, the company will negotiate on behalf of the authors for the best deal with either a software company or a marketing agency.

Sales boost for old machine

AN ATTEMPT is being made to boost sales of the ZX-81. Sinclair Research is making a special offer through all its retailers selling the machine plus the RAM pack and an item of software for £45.

The company is promoting it as a starter pack, 'ideal for the new user.'

The offer began at the beginning of August. It is to continue for at least two months. Sinclair is also giving away five rolls of printer paper with every printer sold in the period.

It is the latest in a series of price reductions for the ZX-81 since it was introduced at £69.95, plus £29.95 for the RAM pack, in March, 1981.

We have moved

ECC Publications, publisher of *Sinclair User,* has moved. The new address for all correspondence, programs and articles is now 196-200 Balls Road, London N1 4AQ. The telephone number for all departments is 01-359 3535.

Prism leads retail revolution moves

RETAILING of Sinclair software is being revolutionised. Prism Microproducts, a sister company of ECC Publications which publishes *Sinclair User,* has plans for distributing commercial programs which will probably mean the end of mail order for software in the Sinclair market.

It has agreed with the electrical retailer Rumbelows to establish software centres in its shops. It also has plans for a new system of electronic distribution which will be test-marketed in Birmingham in the autumn. The software centres will consist of a shop display which will be serviced by Prism. Regular calls are made by Prism staff to restock the centres and remove software which is moving slowly. The system is intended to reduce the risk for retailers deciding which software to stock.

The national agreement with Rumbelows was signed following a trial in the Home Counties earlier this year. It proved successful and other big retailers are negotiating with Prism to expand the system.

From its base as exclusive distributor in Britain of Sinclair Research products to retailers other than W H Smith, it has built agreements with most of the software houses in Britain.

Electronic distribution plans result from an agreement with Romox, a company based in California. It has developed a system which allows retailers to have a programming terminal at which buyers will be able to record blank cartridges or erased cartridges.

The terminal will be updated constantly with the latest programs by telephone line. Retailers do not have to stock pre-recorded cartridges or cassettes, only blank cartridges.

It is also claimed that the system will permit instant nation-wide distribution with no production delays.

Bob Denton, managing director of Prism, says Romox is a logical extension to its present software merchandising programme and to the Micronet 800 service in which Prism has an interest.

At present Romox is not available for the Spectrum but there are plans to include it if the trials are successful.

Smith cuts ZX-81

W H SMITH, one of the biggest retailers of Sinclair hardware and software, has stopped producing its weekly Top Ten ZX-81 software charts because it does not intend to buy any new lines of software for the £40 machine.

Smiths will continue to sell its present range of software but has discontinued the chart as it feels the sales figures would be unrepresentative of the market.

One reason for not continuing to expand its range of ZX-81 software is growing involvement with the sales of other machines, such as the Oric and BBC microcomputer.

Sinclair User is reviewing the accuracy of the charts produced by various sources and deciding whether to continue with the listings. For the present, however, the magazine will continue to show the Top Ten chart for the Spectrum.

Spectrum Top Ten

Program	Last Month	Company	Memory
1 Penetrator	3	Melbourne House	48K
2 Jet-Pak	2	Ultimate	16K
3 Flight Simulation	1	Psion	48K
4 Hobbit	5	Melbourne House	48K
5 Transylvanian Twr.	4	Shepard	48K
6 3D-Tanx	6	d'KTronics	16K
7 Horace Goes Skiing	8	Psion/Mel.House	16K
8 Ah Diddums	9	Imagine	16K
9 Starship Enterprise	–	Silversoft	48K
10 Test Match	–	Computer Rntls	48K

Compiled by W H Smith

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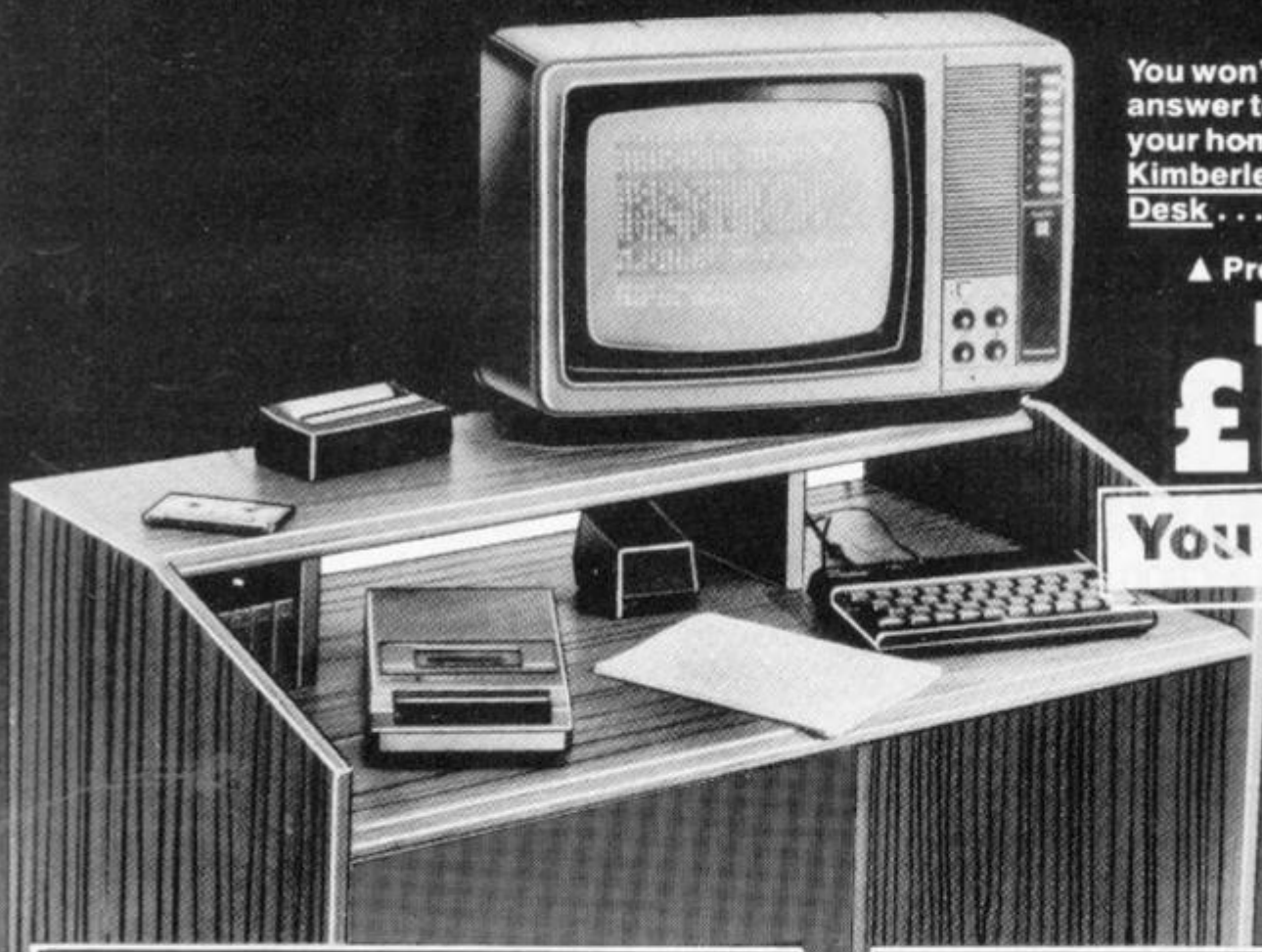

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Psion	Flight Simulation, VU 3D
Protek	Airliner, Spectrapede, Venture, Roadrunner
Rabbit	Escape MCP, Quackers, Race Fun, Centropods
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ZX Spectrum Software
Joystick compatible

ZX 81 Software

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Fly an Airliner into Edinburgh Airport you can take off, land, navigate and manoeuvre using a comprehensive instrument panel, map display, runway view and instruments.

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They're all here in the mushroom patch, Spiders, Snails, Scorpions, Fleas, Worms and, of course, Centipedes. The version with so much. High speed M/C arcade action with three score levels and high score table.

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Dolphin camp confusion

I WRITE with regard to an article in your June edition in which you talk of the holidays organised by Dolphin Activities Ltd as being Dolphin Camps. You will notice that Dolphin Activities Ltd does not use the term Dolphin Camps because that name is applied to some camps which we have organised since 1919.

The Dolphin Camps are canvas camps organised for preparatory schoolboys on the cliff-top at West Runton, Norfolk. In addition, for older children, we organise specialist camps for go-karting, canoeing, sailing.

You will appreciate that the similar names tend to cause some confusion which we are anxious to avoid.

N Taylor,
Walthamstow, E17.

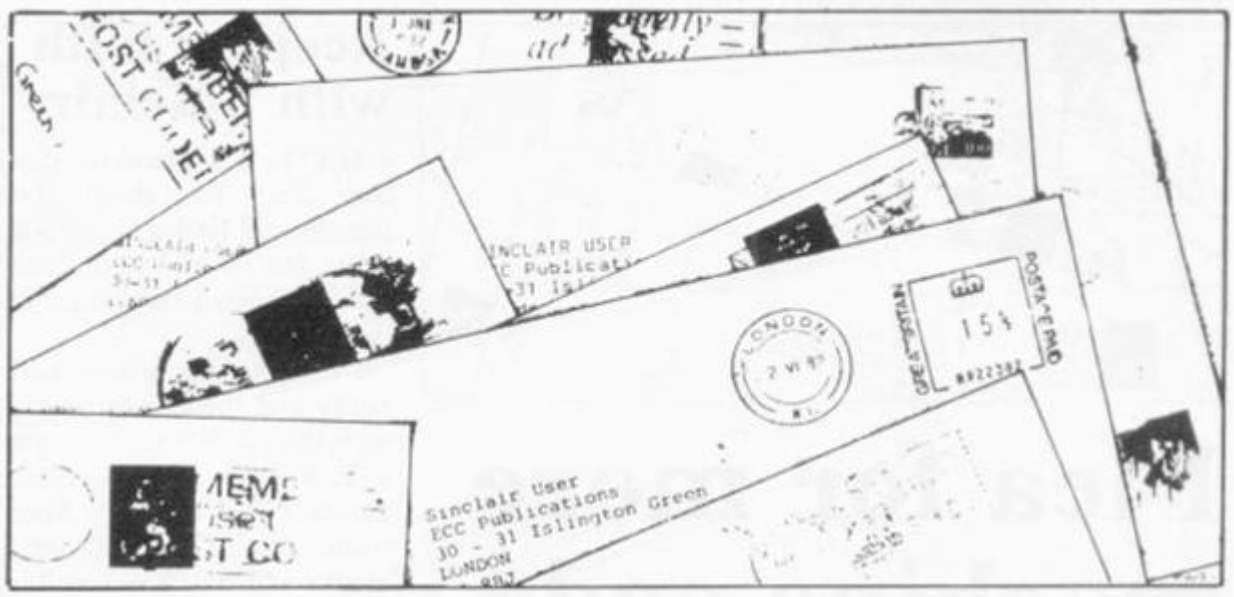
Cheaper file solution

I WAS READING *Sinclair User* Hardware World — May edition — when I saw the article for an improved printer spool.

I believe that I have a much cheaper method of dealing with the problem. A folded piece of printer paper is inserted in the slits in the side of the plastic ends and then wrapped around.

When the end is pushed into the roll of paper it fits much more tightly and seems to eliminate the problem.

Nicholas Atkinson,
Rye, Suffolk.



Unsolicited compliment

MAY I comment on the quality of your magazine? It has improved month by month and I find it an excellent mixture of reviews, comment, news items and advertisements. I look forward to receiving each new edition with increasing interest.

David Brown,
Consett,
Co. Durham.

Simple binary conversion

I HAVE FOUND that among my friends who own Spectrums and also note from many of the programs you publish that many people have difficulty in transposing binary numbers as used in graphics into decimal.

The eight digits can each be allocated a number, thus:

0	0	0	0	0	0	0	0	Binary
128	64	32	16	8	4	2	1	Decimal allocation

If any of the eight digits is expressed as a '1' in the binary number, the number below that digit is taken as the decimal. If more than one box is expressed as a '1', the sum total is the decimal:

0	1	0	1	1	0	0	1	Binary
128	64	32	16	8	4	2	1	Decimal allocation
	↑		↑	↑			↑	

Take the decimal numbers below the '1's which in this example are 64, 16, 8 & 1 and add them together = 89.

B Dickenson,
St Neots, Cambs.

Light work for new input pen

IN YOUR REVIEW of the dK'tronics light pen, to say that the suggested delay routine causes an immediate crash on the 48K Spectrum is a damaging comment and untrue.

Although I have no connection whatever with the company — I am just a well-satisfied customer — I feel compelled to tell you that I have found no difficulty with the delay and to denigrate the excellent device, however slightly, through what must surely have been an error on the part of your reviewer, is unfair.

The delay routine suggested can prove very useful but it is not obligatory. I have written a program for family use which gives two hours' amusement without having to use the Spectrum keyboard, except to enter the number wishing to play, and their names for the scorecards, after loading.

That worked perfectly with the delay routine which your reviewer condemned but I have now abandoned it to speed the action and add another competitive aspect to the game options, all of which, and there are many, are selected by pointing the pen at the appropriate areas on the screen.

Incidentally, I have not written this to sell my program. My efforts in that direction are strictly for home consumption and my own amazement.

I thought it only fair to say that the dK'tronics light pen has added very considerably to the pleasure I derive from my Spectrum and I hope that you will review your review.

Alfred Bone.
Dagenham, Essex.

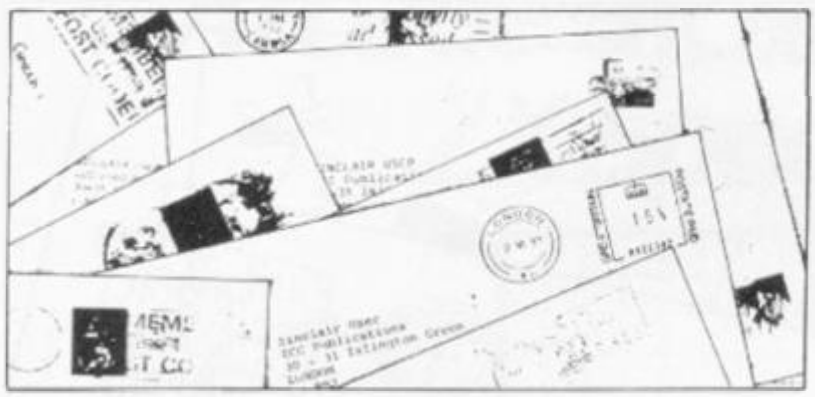
Lower cost of planned cycle

THANK YOU for your review in the July issue. I wrote to you to inform you that we had reduced the price of Cycle Planner/Growth Tracker from £7.25 to £4.95. Unfortunately that was not conveyed in the review which had as one of its criticisms the cost of the cassette.

We had two quarter-page advertisements in *Sinclair User* May/June — and have refunded £2.30 to all mail-order customers after May 25.

Medidata,
London NW9.

more Letters p.20



Plea for more machine code

HAVING RECENTLY bought a Spectrum, I have restarted the quest for machine code programming, having already broken through on the ZX-81. I can say now that I am fairly proficient at it but I wish to make a complaint.

You have not yet in any *Sinclair User* issue made more than a passing reference to Spectrum MC and little more in the case of the '81. Machine code programming is not really so difficult if you try and it is most satisfying. I am sure it would become much more commonplace if you printed articles on MC programming techniques and advice, and fewer articles in the vein of User of the Month and fewer large, spacious illustrations and pictures.

Further, what about giving Andrew Hewson more pages? He is often helpful and is to be encouraged.

Finally, I 'am glad to see that you often review current software, as an unbiased opinion is often a good guideline on a certain tape. In the one tape I have bought which you had reviewed, however, I was misled by you. The game, Winged Avenger by Work Force was, you said, difficult. That is rubbish. When my sister, aged 11, and I play it, the only limiting factor to a high score is how many hours we have to spare to play. It is undoubtedly the worst Spectrum game I have seen, so please review games critically.

J H Fletcher,
Wirral,
Merseyside.

● *We are looking at a series on machine code programming on the Spectrum but will not be printing it at the expense of more general articles, such as User of the Month. Our readers have a wide range of interests and we shall attempt to continue to cater for all of them.*

While one person's criticism is another's flattery, we always try to give readers a good idea of what to expect from the software on the market and will not be afraid to make critical remarks where they appear justified.

Disc limits warning

I BOUGHT a copy of Pete Shelley's cassette XL 1. I had problems loading the cassette into my Spectrum, so returned the cassette to the record shop, which exchanged it for another copy. That copy would not load.

I telephoned the record company, which told me that the cassette is only for the 48K Spectrum. Nowhere on the cassette or the packaging did it say so. I would like to warn other 16K Spectrum owners to prevent them buying the cassette hoping to load it into 16K Spectrums.

Bryan Griffiths,
Luton, Beds.

Keeping faith with Sinclair

I HAVE been reading *Sinclair User* for about five months and find it very good value, but I have had difficulty with Sinclair computers in the past.

I had two 81s which were faulty and then I got fed up with the two 81s and brought a TRS-80. It had no colour graphics so I bought a Spectrum, which I have had for a month and find it a very big improvement on the ZX-81. Keep up the good work.

R Cordes,
Sittingbourne,
Kent.

Randomized screech

WHILE I was experimenting with the command RANDOMIZER USR on my 16K Spectrum I discovered that by typing-in RAND USR 1331 a magenta and blue-striped border was produced and a screeching sound was emitted from the computer. That can be stopped by pressing SPACE.

That strange bug, if it can be called that, can easily be accommodated in games, as it apparently has no effect on a program.

Does anyone know why it does it or how it does it? Also does anyone know a method of getting rid of the aggravating Spectrum buzz?

I would like to conclude by pointing-out a bug in Andrew Hewson's decimal loader on page 102 of the June *Sinclair User*. Surely line 60 should read GOTO 20 or the numbers are poked into the same address each time?

Aidan Taylor,
Loddon, Norfolk.

Portable computers

IF ANY READERS are looking for a cheap, strong carrying case for a small computer, could I recommend the Gear Box from British Home Stores? It is a strong plastic lunch box 36×28×12cm. and holds my Spectrum, all leads, a small tape recorder and a few tapes and books. I have lined it with thin foam. It does the job well and costs only £4.50.

Many thanks for an excellent magazine. My only complaint is what happened to the regular education slot?

Elizabeth Atherton,
Chester.

Extra resistor causes problems

LIKE ALL apparently simple solutions to the problem of ZX-81 over-heating, W D Langton's ideas of a 5ohm resistor in the power supply lead is likely to lead to additional problems which could be even worse than over-heating.

My ZX-81 with 16K memory draws, on average, 700ma and when the printer is working at full stretch it rises to 1,100ma. Now 700ma will cause a voltage drop of 3.5V, and 1,100ma a drop of 5.5V across the 5ohm resistor. That means that the original 10.5V — 10.75V on my Sinclair power pack — will drop to either 7.25V, or 5.25V if the printer is 'flat out'.

In addition, the value of the smoothing capacitors on the Sinclair power supply means that a ripple voltage of 2.2V at 700ma, and 3.4V at 1,100ma, is present. When the ripple voltage is subtracted from the voltage with the 5ohm resistor in circuit, it does not take much imagination to realise what can happen, as the ICs in the ZX-81 require a 5V supply. Hence the reason for the 5V regulator in the ZX-81.

There is a minimum volt-

age drop across the regulator which will not work properly unless the voltage to the regulator is at least 7V.

Practical consequences can be white-outs, crashes, printer malfunction — just name it, you have it.

The only really satisfactory solution is a regulated power supply of about 7.5V, which will cure all problems.

If a simple compromise 'cure' is sought, it is well worthwhile inserting four silicon rectifier diodes of 2-amp rating into the supply lead instead of the suggested resistor; doing so will give a voltage drop of about 2V irrespective of the current drawn by the ZX-81, which is not the case should a resistor be used.

Another improvement would be to increase the value of the smoothing capacitors by 2000MFD. The ripple voltage on the supply line would then, at worst, be 2V instead of 3.4V.

Although not perfect, the result would be that the ZX-81 ran much cooler and any other problems would not be precipitated, or made any worse than before the modifications.

Charles Rowbotham,
Carnforth, Lancs.

Is this a new record?

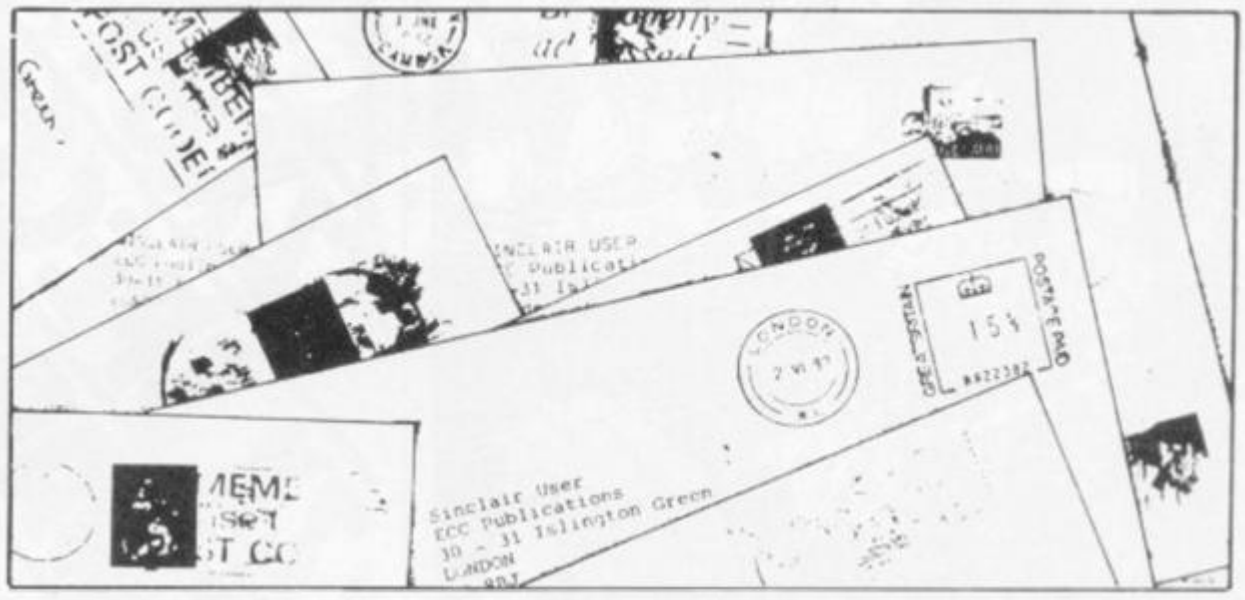
I HAVE just saved Bill the Worm from the ninth level in Mind Out for the 48K Spectrum. My score was 7,400; is that a record?

I have also scored 82,812 on the Silver Soft Cyber Rats and 153,350 on Artic 1 Galaxians. Why not print a league table of high scores every month?

Graham Lawrence,
Maidenhead,
Berkshire.

Expanding factorials

THERE ARE various programs for calculating permutations and combinations. They always have limitations



because they necessitate, somehow or other, calculating the factorials of various numbers; the factorial of a number, of course, being 1×2×3×4 . . . up to and including the number. Calculated that way, the biggest factorial which can be computed on a Spectrum is 34.

With a little improvisation, the range can be extended considerably, by using the logarithm key:

```
5 REM LARGE FACTORIALS
10 PRINT "FACTORIAL NEEDED?":INPUT X: PRINT X
20 LET A=LN 1
30 FOR B=1 TO X
40 LET C=LN B
50 LET A=A+C
60 NEXT B
70 LET D=A/ LN 10
80 LET E=D-INT D
90 PRINT "FACTORIAL OF X;X;" IS "; 10↑E; "TIMES TEN TO THE POWER"; INT D
```

I have not discovered the limits of the program. I have established that the factorial of 2,000 is 3.3163794 times 10 to the power 5735. It must be said that my Spectrum is a little costive in yielding results at this level and patience is called for.

Rev H S Corran,
Shankhill,
Co Dublin.

Large demand at low price

IN THE JULY ISSUE, Early end for the ZX-81? you write that in your opinion there is probably a base price for computers of about £30 and also that a fall in prices would mean the early end of sales of the ZX-81.

In my school, and I am sure the same could be said for most schools, the only opportunity many children have for devising their programs is when they have the chance of time with one of the school machines. They would dearly love to have their own machines but their parents cannot afford the £40 for even a ZX-81.

If the basic price of a ZX-81 fell to £30 or even lower, many parents would not only be able but also keener to buy. If a child did not sustain interest, the amount spent would not be too great; if interest was sustained it would be money well spent. Further opportunities — birthdays and Christmas — would provide extras or even a trade-in for something better.

D Gilbert,
William Bellamy
Junior School,
Barking, Essex.

Club call in Tameside

I WOULD like to start a Sinclair computer club in the Tameside, Lancs area but first need to find if sufficient people would be interested.

Jacqueline Wright,
17 Crawford Terrace,
Ashton-under-Lyne,
Lancashire.

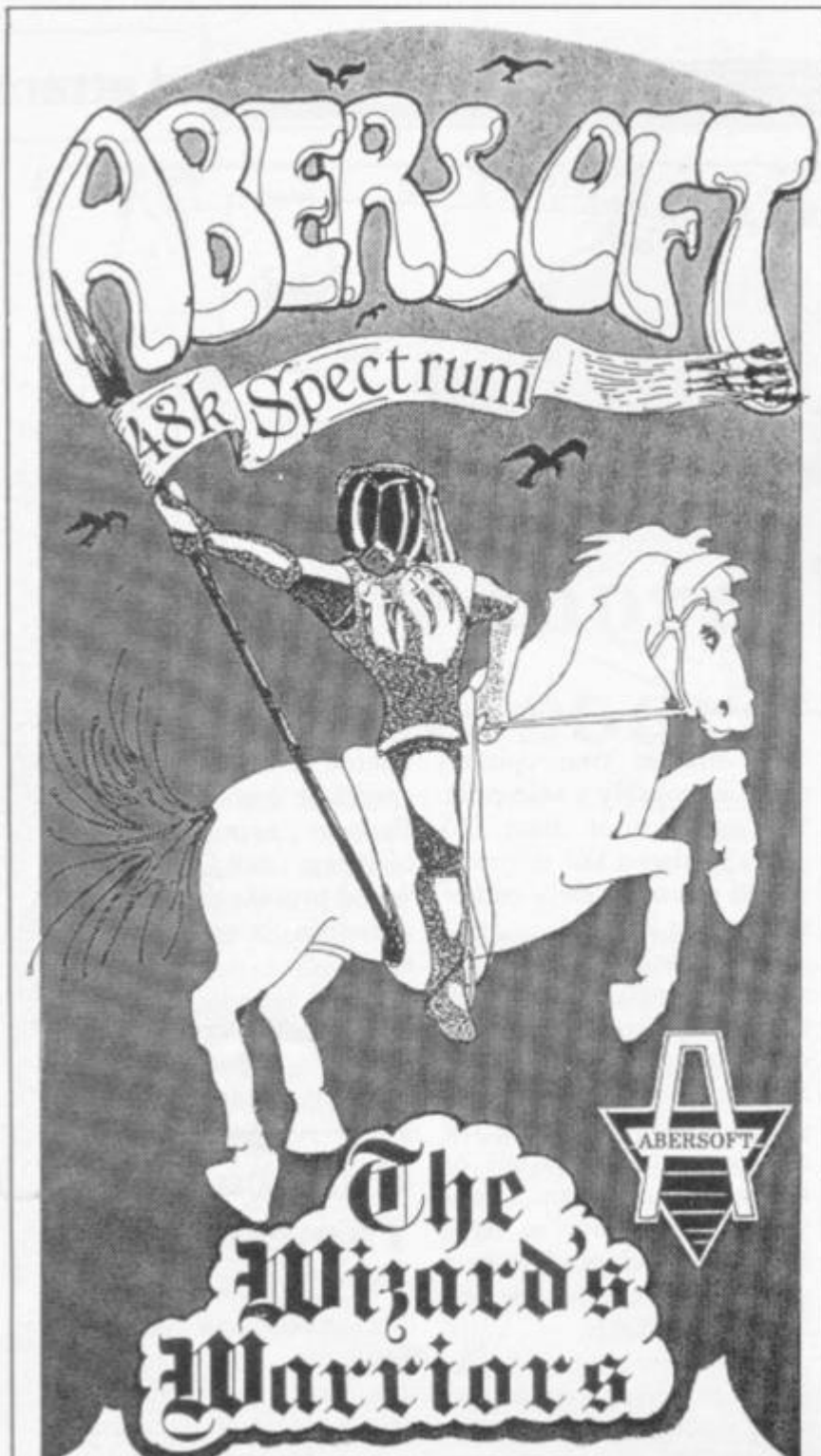
Making notes while listing

THERE ARE two small improvements I think you could make to *Sinclair User* — the addition of small notes under the program listings illustrating how programs can be converted from the Spectrum to the ZX-81 or vice versa; and how about reviewing the software produced by smaller firms such as the ones which advertise in the Supermart.

Apart from that, does anybody know of a Basic statement which will read what is typed-in and give X that value, replacing the lengthy "IF INKEYS="2" THEN LET X=2" statements?

Alistair Hodgett (13),
Cheshire.

● *Thank you for your tips, which we are considering. In our reviews we make no distinction between large and small companies. Because most companies advertising in Supermart tend to be small, new producers, there is not always time to review their products at the time they advertise.*



THE WIZARD'S WARRIORS: A fast moving game that matches developments in your skill as a player by becoming increasingly more devious. By offering to you the full range of options you can choose how to control your warrior throught the maze. A full implementation of this program enables such features as a continuous series of sound effects, arcade quality graphics, double-point scoring, and-for the very artful-bonus lives — **Spectrum £4.95**

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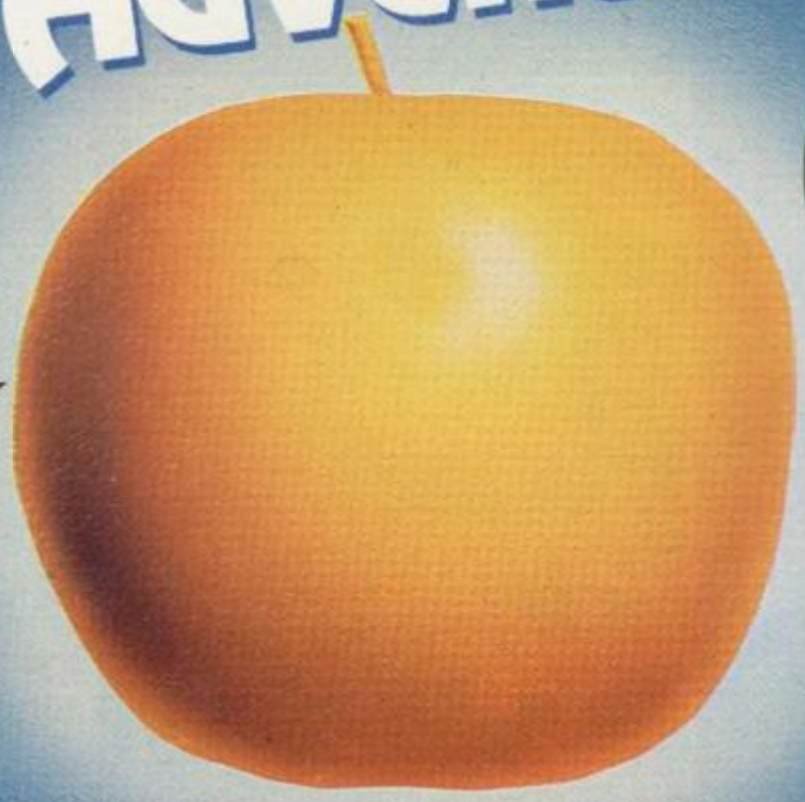

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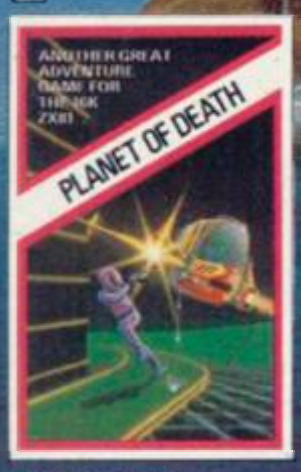

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16K ZX81
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B

48K Spectrum
16K ZX81
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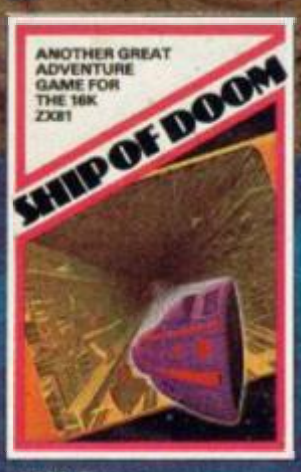
C



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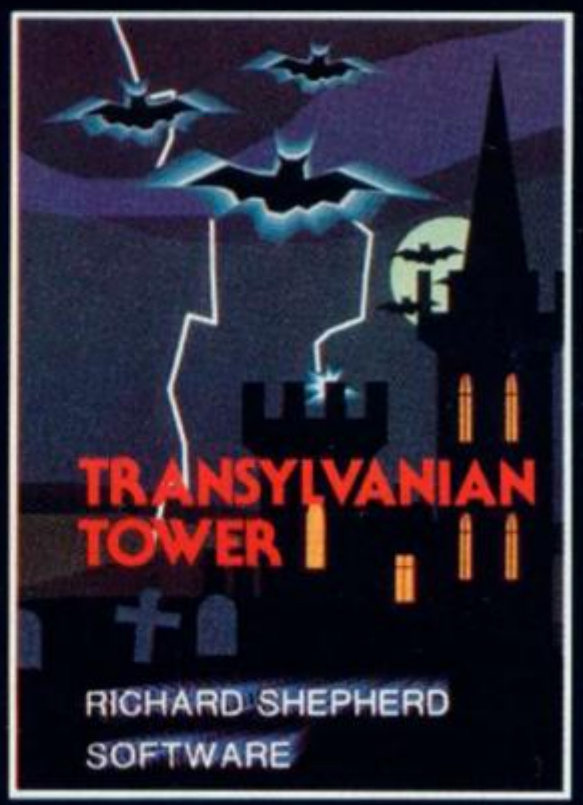

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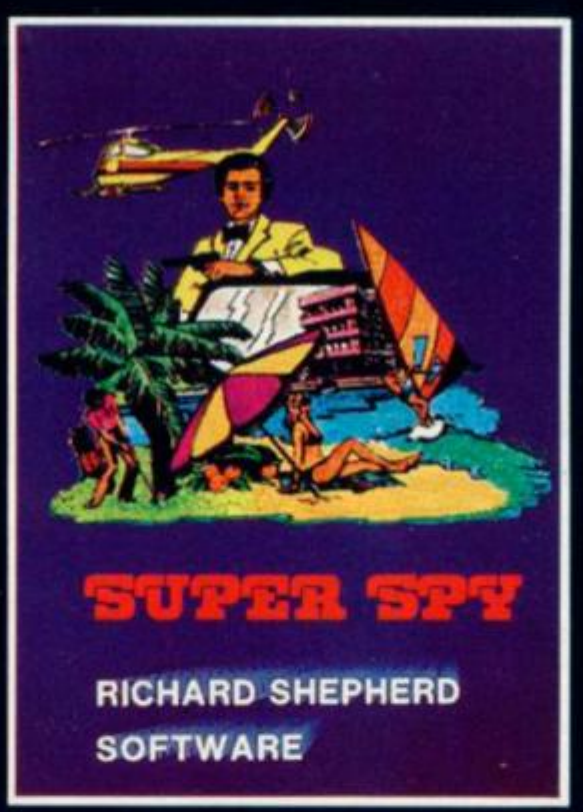

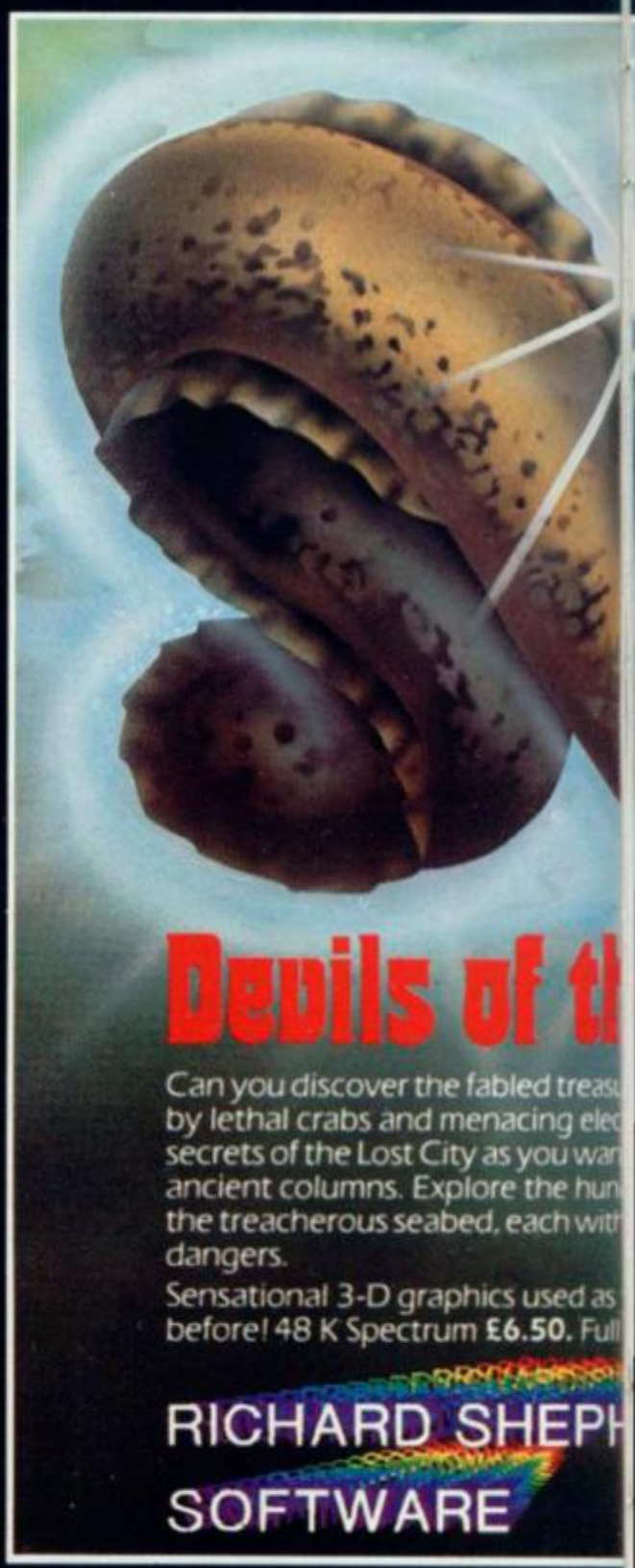
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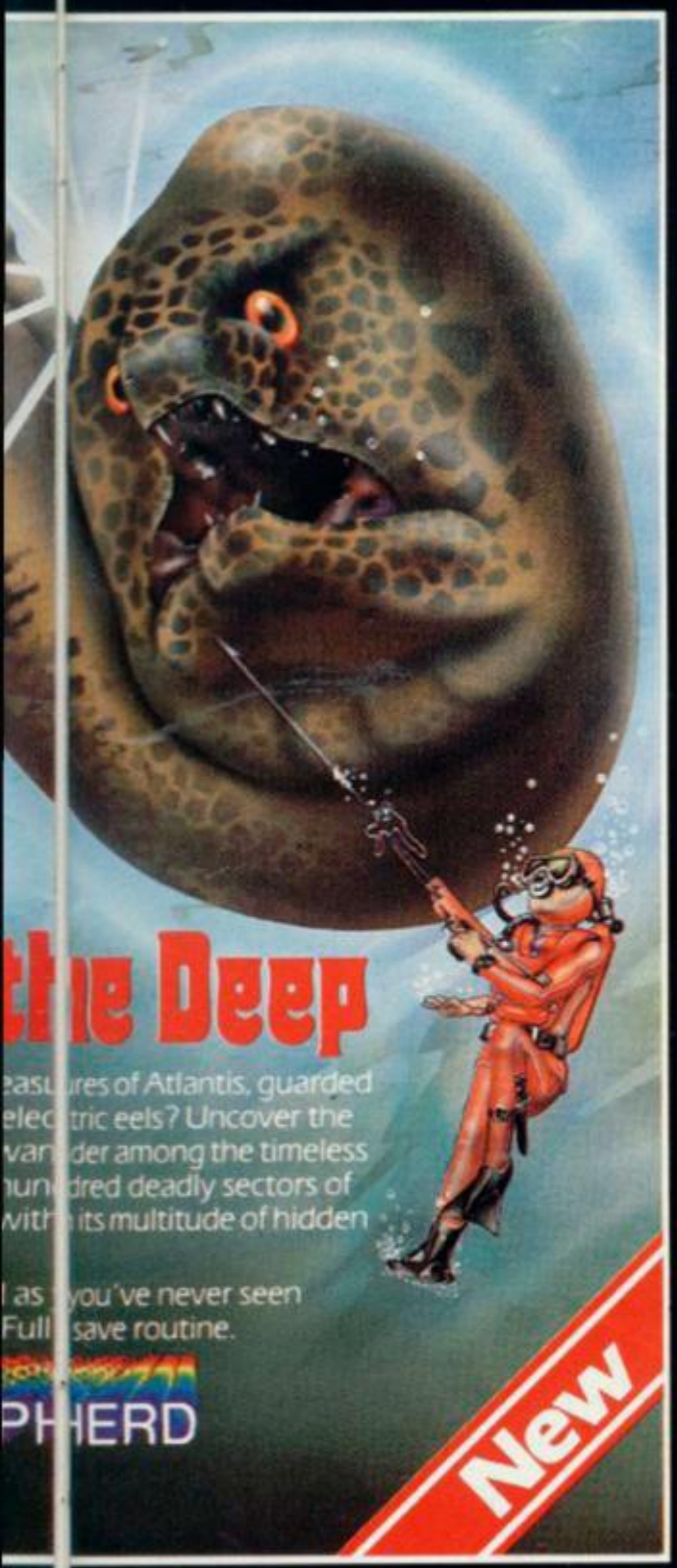

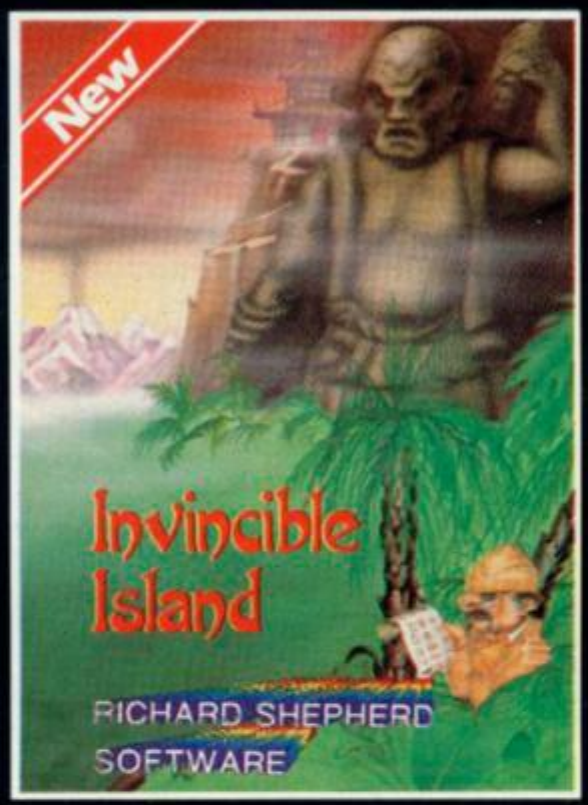

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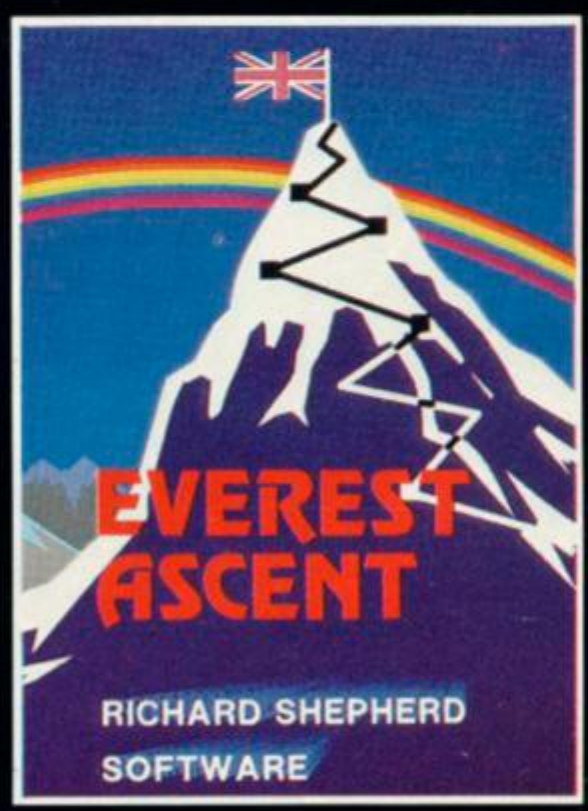

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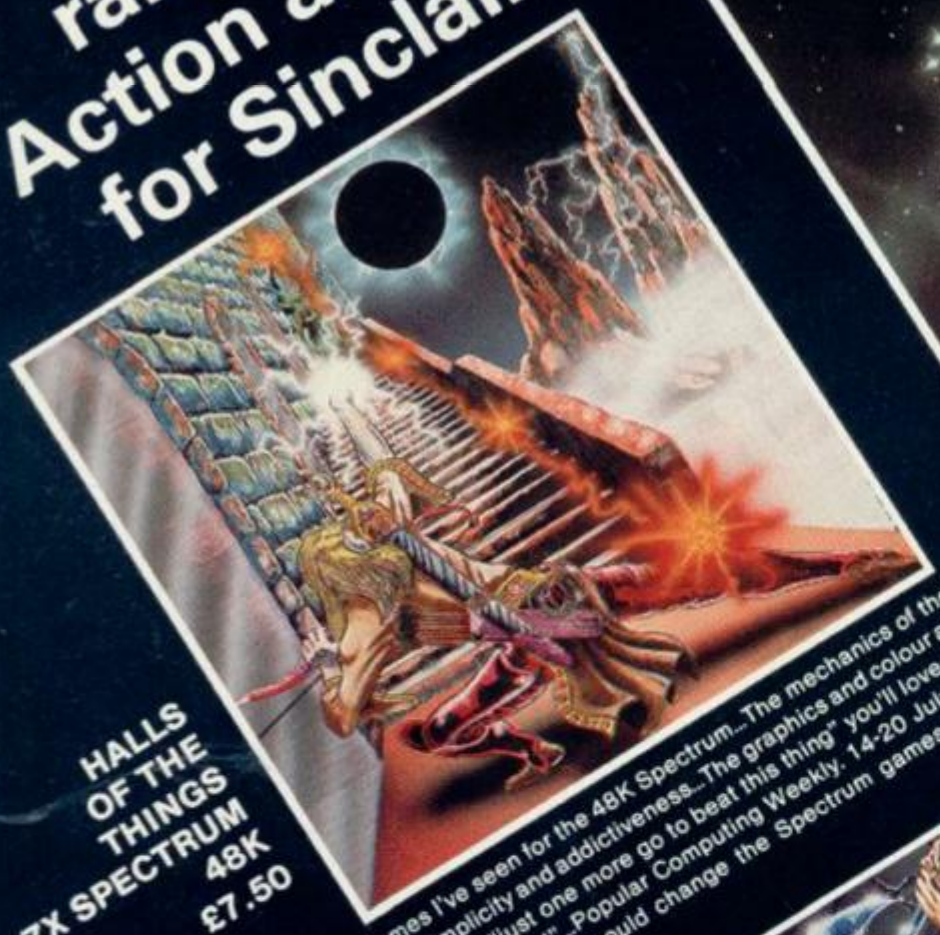

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Stylish keyboard

STEATITE Insulations has produced one of the most stylish keyboards yet for the ZX-81. It has a sloped front and 40 push-button keys. The keys are labelled just like the ZX-81 with keywords printed on the case. The ZX-81 will not at present fit inside the keyboard; its steel base provides no room to fit it but Steatite plans to change that. The ZX-81 connections are made by soldering two cable strips under the keyboard sockets after pushing them through the hole above the ZX-81 keyboard.

The instructions are clear and simple and the keys a pleasure to use. The only problem seems to be dished tops of the keys which are a little difficult to insert. Steatite says that it wants to improve the keyboard as much as possible.

Contact Steatite Insulations Ltd, Hagley House, Hagley Road, Birmingham B16 8QW. Tel: 021-454 8661 for the keyboard, which costs £30.95 inc. VAT and postage.

RAMpack grip

IN THE JULY issue a review of ZX-81 RAM packs omitted the name and address of Audio Computers. It has now sent a newer version of its RAM pack which it has been selling for the last three months. It is much better than the one tested previously as the edge connector is different—it is now black with a tinned spring instead of gold-plated—and has longer feet to take it up to the correct height. The RAM pack grips with a ridge of plastic on top of the ZX-81.

Audio Computers is at 87 Bournemouth Park Road, Southend-on-Sea, Essex. Tel: 0702 613081. The price of the 16K RAM pack is £19.95 plus £1 postage and packing.

Universal joystick produced by AGF

AGF has produced a programmable version of its joystick board which works on either the ZX-81 or the Spectrum. There are two joystick sockets for standard Atari-type joysticks but they both operate the same keys. There is no longer a need for a specially-modified joystick. The programming is done for each of the five positions of <, >, :, /, and FIRE button by two crocodile clips for each of the positions.

One clip selects one of five 'D' bars and the other one of the 'A' bars. Thus any of the keys on the 40-key keyboard can be simulated by various combinations of the two clips.

A chart is given on the back of the joystick giving the 'D' and 'A' numbers for the various keys.

It would have been far easier to use if it had been set out like the keyboard in a 10 by 4 line matrix instead of an 8 by 5 matrix. It would also have been useful to see that or a picture of the keyboard showing the relative 'A' and 'D' lines in the instructions.

Ten programming cards allow the user to mark the position of the clips for various games, so reference to the instructions is not required every time. Extra packs of 10 can be purchased for £1.

The board has an extension piece on the back for any other add-ons and is easy to use.

One difficulty might occur for people who have fitted a ZX-81 or Spectrum into a case; the crocodile clips may not fit between the case and the board which is tight against the back of the computer. The board should be very popular with games users as it means that any software can be converted to use joysticks without special tapes or joystick-adapted programs. It cannot be out-dated as all games have to be designed to use the keyboard.

The joystick board costs £33.95 and includes a demonstration tape. Joysticks cost £7.54 from AGF Hardware, Freepost, Bognor Regis, West Sussex PO22 9BR.

Sturdy stand limits growth

COMPUTERLOCK produces a large black tray and stand for the ZX-81 or Spectrum which tidies all the wiring for a computer. You can stand a TV set on top of the stand, which is about 9in. high, to provide a better view. The tray is large—25×17½in. with a 1in. wide ridge all the way round. The TV stand should support the weight of most TVs and the model tested had the two extra mains switches fitted. They are optional extras at £3 each but you will have to wire them to the mains yourself. If you are unsure you can ask an electrician to wire it from the diagram provided.

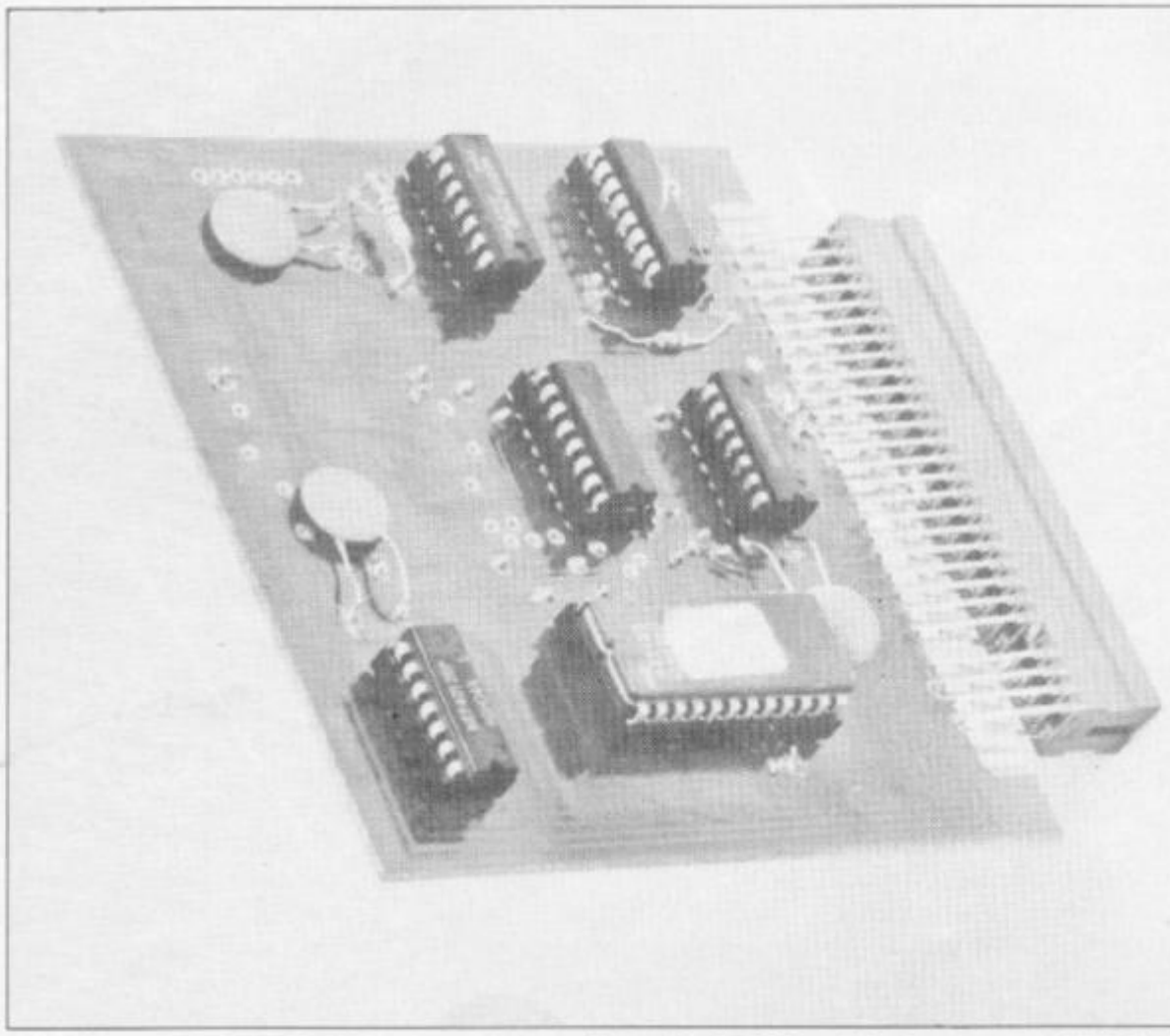
A hole in the front of the stand permits access to the keyboard but the remainder of the wiring is hidden.

The cassette leads can be taken out of the side of the stand at the left but they will be near the mains leads, as that is the only exit. It will not be possible to use the Sinclair printer as it will be under the stand, as well as any Microdrives.

Altogether a sturdy package but it would be difficult to use if you intend to add anything on the back of the computer which requires access during programming. The Computerlock console costs £31.50 and is suitable for the ZX-81 or the Spectrum. Computerlock, 2 Wychperry Road, Haywoods Heath, West Sussex RH16 1HJ. Tel: 0444 451986.

More Hardware World

EPROM boosts Basic facilities



ORME ELECTRONICS Eprom Read card for the 16K and 48K Spectrum fits into the ROM space which is unused at present and can provide more facilities for Basic programs. With the EPROM I fitted, 10 extra routines are added for program editing, such as block delete of any section of program, re-numbering, variables dump. Commands which can be used in programs include left and right scrolls of the screen, TEXT justifier—to the printer only— and a very good sprite routine which will allow you to print various-sized characters at any location on the screen.

It will also allow you to turn round the characters by 90 degrees and print them in inverse and/or over other characters. There is also an extra graphics set which can be called-up from the ROM into the user-definable graphics area.

Each of the routines is used by giving a RANDOMISE USR—variable—command. An OUT command must also be used to change to a different section of routines as only 1K of the ROM is available at a time. The first routine is called by a number every time the program is RUN and that sets up the variable names to be used in the rest of the program. So, for instance, RANDOMISE USR REN would renumber all the lines in increments of 10 from 10.

The routines are easy to use if the examples are followed to the letter. VRD—variable dump—works only on variables created after the variable set-up routine and deletion of lines works only with lower-case REM del statements.

Prices update

The EPROM board for use with motherboards costs £18.50 and the direct connecting type £21.25. Tape control costs £3.45 extra, as does EPROM I at £9.95. Postage and packing costs 75 pence for the U.K. and £1.75 overseas. Orme Electronics, 2 Barripper Road, Camborne, Cornwall TR14 7QN. Tel: 0209-715034.

IN THE AUGUST issue in Hardware World, we gave the price of the Tactile keyboard as £99.95. It should have been £9.95, with the price of the demonstration tape as £5.95 and not £92.95.

We also said that the Jiles tape copier cost £99.95. It should be £9.95.

Database interface opens new world to users

COBRA has been advertising its RS232 interface for the ZX-81 for some time. Its TMS terminal package consists of a tape and a black box which fits on to the rear of the ZX-81. Out of the black box emerges a single grey lead containing three wires, one 0V, one red output wire and one blue input wire. The wires need to be connected to a modem and a 300 baud acoustic modem was used to try the TMS pack with Telecom Gold.

Once the interface and a 16K or bigger RAM pack is plugged into the back of the ZX-81 the power can be turned on and the TMS tape LOADed. Telecom Gold service was dialled to gain access to a private database run by Cobra.

The TMS program must first be set up for the correct speed, number of bits sent by the use of a very good menu which allows you to select only one character option for each instruction. Cursor controls are provided to move from one instruction to the next.

If a selection is incorrect the program will not leave the menu when pressing NEWLINE and will place an asterisk over the mistake.

Among the options of the program are the ability to send control characters—for special options—upper- and lower-case, even though the ZX-81 will display only upper-case—and obtain a hard copy of the result on the Sinclair printer.

Once on the Cobra database you have a choice of playing games, sending messages to another user via the

continued on next page

continued from previous page

Mail Box facility or talking directly to another user as well as using Telecom Gold facilities. All the facilities and access have to be paid for. Cobra hopes to set up, with British Telecom, a network of home users to take advantage of the system.

Having an RS232 does not restrict you to using Telecom Gold; it can be used on most databases or bulletin boards—like electronic newspapers run by user groups.

The system works well within the limits of the ZX-81 but a few limitations were noticed—not due to the interface. One was the ZX-81 keyboard which made reliable communication difficult and the other was the telephone line. The system used depends on the distant computer sending back your message for you to see—called full duplex—and the message can be garbled both ways, leaving you unsure whether it was due to your mistake or that of the system. That was due mainly to line noise.

The TNS package costs £71 from Cobra Technology Ltd, 378 Caledonian Road, London N1 1DY.

Another solution to RAM pack wobble

KELWOOD COMPUTER cases has two computer stands—the Wobble Stopper for the ZX-81 and the Power Base which has versions for both the ZX-81 and Spectrum.

The Wobble Stopper is in three versions—small, tilted and large, for use with the Sinclair printers. Tilted versions are available in small and large sizes. All versions have a white nylon screw at the back which is tightened to prevent the wobble, clamping the RAM pack firmly to the ZX-81.

The Power Base is a sloping stand of about 15 degrees which has two rocker switches mounted on the sides. The right-hand side switch controls the power to the computer and can be used as a RESET switch. The power plug from the power pack is plugged into the back of the stand and the computer obtains its power from a lead which is terminated inside the stand. The other switch controls the two MIC and EAR leads.

The cassette leads are intercepted and plugged into the stand from the computer; two 12in. long cassette leads are then plugged into the tape recorder from the stand. The front of the Power Base has a turned-up edge to hold the computer firmly. The only screws are for getting into the base and to hold the rocker switches and power socket to the case. They are also supplied with rubber feet.

Power Base and Wobble Stopper are available from Kelwood Computer Cases, Kelwood Heating Ltd, Downs Row, Moorgate, Rotherham S60 2HD. Tel: 0709 63242. The cost of the ZX-81 stand is £5.25 for the small and £5.75 for the large; tilted types cost £1 extra. Power Bases cost £13.50 for the Spectrum and £13 for the ZX-81, inc. VAT and postage.

Permanent storage

EPROM SERVICES has a range of EPROMs available for the ZX-81. EPROM I contains 10 small routines for program editing such as block line delete, delete up/down from line x, re-numbering—only the line number, no GOTOs or GOSUBs—and various checks on memory such as program length.

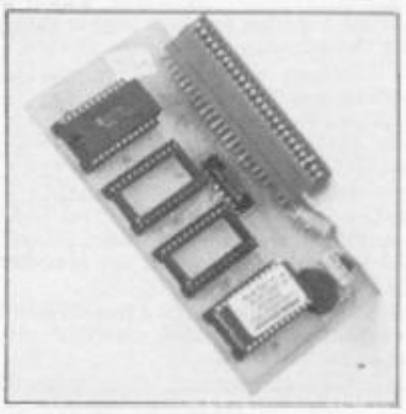
The next 12 routines are for entering machine code into REM statements, in HEX only, and extending and modifying both the machine code and the REM statement. There is also a very useful hex dump facility to view an area of memory which gives eight columns of hex addresses and the data in them on the screen.

Sixteen more routines contained in the EPROM I deal with the screen display and, together with a 6116-type 2K RAM chip at addresses 14K–16K on the same board, allow you to store machine code or TV screens in the RAM. That data is thus protected from a Basic program and can be recalled at any time. That makes a total of 38 routines in one ROM, a real achievement.

EPROM II concerns tape routines for a rapid SAVE and LOAD. EPROM IV contain a very good ZX-81 monitor program. It requires that the board be fitted with the same 2K RAM as with EPROM I to store the monitor screen and separate machine code stack. All the system variables are saved on entering the monitor and all the various Z-80A registers can be set before entering a machine code routine.

Two more useful instructions include ZX-81 versions of the IN and OUT instructions on the Spectrum for transferring data to I/O ports. Machine code can be SAVEd and LOADed from the monitor under the name 'M'. The monitor will work on the minimum 1K RAM ZX-81 and does not require a 16K RAM pack.

Breakpoints and the dumping of the Z-80A internal registers is done into the 2K RAM so that a system crash does not result in the loss of



code; a re-set key must be used and the power plug left in.

The EPROM board plus EPROM I is sold for £20 including VAT and postage. Additional EPROMs II to IV cost £10 each and the 6116 RAM costs £6. Eprom Services is at 3 Wedgewood Drive, Leeds LS8 1EF. Tel: 0532-667183. It also does development work and EPROM copying/programming.

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The Interface plugs on to the rear connector of your ZX81 or ZX Spectrum.

Quick clip-on connections, which are configured from a reference card supplied, allow you to define which of the forty keys are simulated by which action of the Joystick. A pack of ten Quick Reference Programming Cards makes setting for your favourite games even easier. These can be filled in to show at a glance the configuration required and stored in the cassette case of the particular game. When you change to a game using different keys the module is re-programmed in a few seconds.

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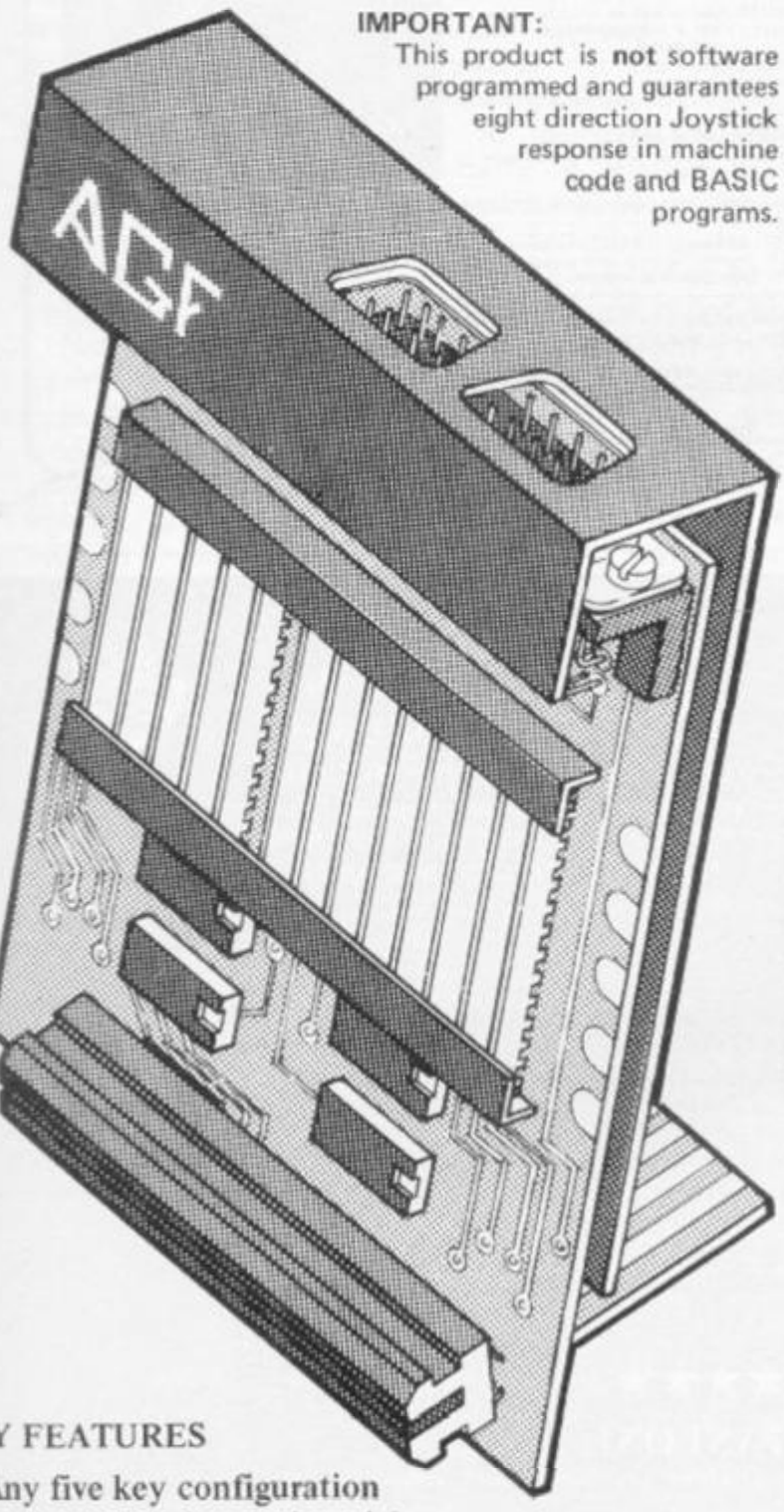

IMPORTANT:
This product is **not** software programmed and guarantees eight direction Joystick response in machine code and BASIC programs.

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We are pleased to say that future software support commitment for the AGF Interface II has been negotiated from many of the companies listed above.

For example all new titles from Imagine, commencing with Zzoom, will be compatible and carry the compatibility logo, shown below, on their packaging. This new logo scheme will help you select software that is guaranteed compatible and is also being adopted by many of the supporting suppliers.

At the time of printing it is hoped that pending releases from Bug-Byte will enjoy AGF compatibility.

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AGF Hardware, 26 Van Gogh Place, Bognor Regis, West Sussex PO22 9BY

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- if you can answer **YES** to the above **you should be playing REDWEED.**

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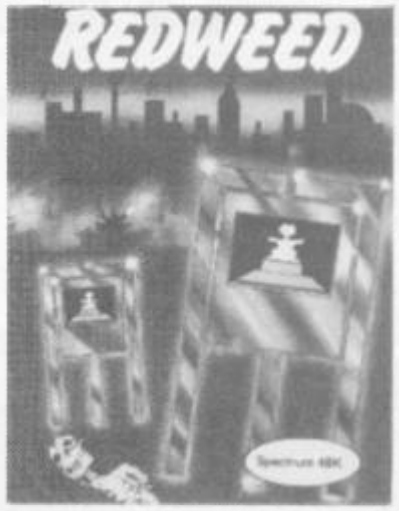

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- ★ up to 128 characters per ITEM
- ★ save and load FILE independently of the program
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Display
- ★ up to 36 different user-defined ways of viewing selected data
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New polish on old favourites

ORWIN SOFTWARE has released no new software for about six months, so its **Cassette Five** is a long time overdue. As with all Orwin software, it is for the ZX-81 and most of the six programs run in 16K. All except one of the programs are popular arcade games such as **Byteman,** a version of Pac-man, and **Blitz,** a version of City Bomber.

Most of the games are in machine code. The one written in Basic is **Merchant** and its author is Michael Orwin, who started Orwin Software more than a year ago.

Merchant is a strategy game in which you must visit ports such as Alexandria, Venice and Florence. During your stay in Florence you can visit your old friend the moneylender who appears in many of these types of games. He will give you financial assistance or you can leave your money for him to look after. Both options usually result in the same thing.

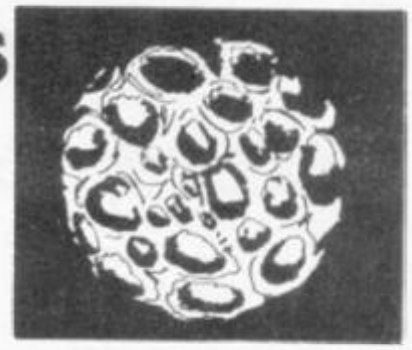
The game includes graphics and, although it is not very original in concept, will provide some entertainment as you try to make your first million.

The other games are machine-coded. They need to be, as they are all arcade favourites. The games are unoriginal in concept but the quality of the software and the smooth action displays created on the screen make the programs worthwhile for anyone who has a ZX-81 and plays games using it.

Most of the games include well-presented instructions which make them easier to play. It is pleasant to see that Orwin's kind of quality is available again.

Cassette Five can be obtained from Orwin Software, 26 Brownlow Road, London, NW 10 9QL. It costs £6.

Tired idea fails to impress



A NEW COMPANY, Orion, has launched into the ZX software market with a lunar lander program for the 16K ZX-81, **Moon Lander.**

Lunar lander programs for the ZX-81 are not something which we encounter very often these days. This type of program idea is well-worn and anyone producing another version should be sent into orbit.

At the start you have a chance to select a practice touchdown. More often than not when playing the game you will be informed that there is a new crater on the lunar surface where you have just landed. For that reason a practice routine is a necessity. When in flight, the control panel with all the landing instruments is shown, together with an indicator marking the height at which you are orbiting round the moon.

That update of the display is fast but the program stops every time it requires an input from the keyboard.

It would have been better to use an INKEY-type routine for it. The game would have been made faster and the player would not have to press NEWLINE for every entry.

The instructions are printed on the cassette insert. They lack structure and provide little useful information to the budding astronaut. The language used would be better understood by a NASA trainee than someone who wants to play a game.

Unfortunately there is not much we can say in favour of the game. It is unoriginal, the instructions are largely unintelligible and the screen display is confusing. It is, however, the first Orion product and should be treated as such.

Moon Lander can be obtained from Orion, Fippbrook Mill, London Road, Dorking, Surrey, RH4 1JE.

User-unfriendly games guide

SINCLAIR RESEARCH has launched two new games, **Sabotage** and **City Patrol,** for the 16K ZX-81. Sabotage is a game in which you must take one of two roles, either the guard or the saboteur. If you choose to be the guard you must protect the randomly-placed boxes of ammunition which litter the compound.

If you are the guard, you will have to corner the saboteur before he can plant explosives in a secret place. If you are not quick enough, the explosives will detonate and you will lose some of the boxes of ammunition.

Your score will decrease depending on how many boxes you lose. If you capture the enemy, the points added to your score will, of course, be unaffected by the number of boxes blown-up.

You may want to take the role of the saboteur. In that case the game changes and you must evade the guard, played by the computer, and plant your explosives. Your score depends on how destructive you can be. The program has an original games concept and the action is reasonably smooth. The only problem occurs in the instructions which are printed on the cassette insert card. The game is explained in simple fashion and the movement keys are shown. The difficulty is that Sinclair Research seems to have taken it for granted that the user will know which key moves the figure which way on the screen. The W and S keys move the character up and down respectively and the H and J keys move it left and right.

Sinclair may be correct in thinking that most users will know which keys do what but many users will certainly be beginners who have just become accustomed to the keyboard.

In City Patrol, a city is on the verge of destruction as enemy fighters zoom in and try to raze buildings to the ground. It is your task to take on those invaders and destroy them. At the very least you must prevent them destroying the skyscrapers.

The game produces a 3D view of the city on the screen. There are four levels of the city and you can select which one you want to enter at the start of the game. We rate the game highly because of its depth of graphics and plot. It is difficult to produce such a smooth 3D effect on the ZX-81.

The instructions are easy to understand but, as with Sabotage, they could be more clearly set out on the cassette insert. We found it difficult to keep track of the instructions because they were cramped into such a small space and, in certain parts, were too verbose. Each instruction insert starts with a story line and if that was abbreviated, more room could be allocated for the playing instructions.

Sabotage and City Patrol are available separately from Sinclair Research, Stanhope Road, Camberley, Surrey, GU15 3PS.

Excellence in combat

THE LATEST release from Artic Computing is for the 48K Spectrum and can only be described as excellent in almost every detail. **Combat Zone** is a version of Tank Battle, a game which can be seen in most amusement arcades. It is a three-dimensional game which has become popular the last few months.

You are the only survivor of a battle fleet of tanks. Your tank roams around a landscape made up of three-dimensional pyramids. You must confront and destroy the enemy tanks and spaceships which attack you.

The display is completely in 3D and although the game is difficult to play at first, strategies can soon be learned and you can become a crack shot.

The author has produced a display format which adheres strictly to that of the type of game you find in arcades. Everything has been finely-tuned to add to the player's enjoyment. You can even specify whether you want to concentrate in total silence.

3D Combat Zone can be obtained from Artic Computing Ltd, 396 James Reckitt Avenue, Hull, North Humberside, HU8 0JA.

Banking on the success of a home accounting system with security

THERE ARE surprisingly few bank account programs for the Spectrum but those which are available are excelent pieces of software.

Bank Account System, for the 48K Spectrum, will store all the details of a bank account, whether they be cash or cheque transactions. It will keep account of the payment of standing orders and also calculate and update the balance.

The system provides full error-trapping and will not allow you to type-in any incorrect answers, although there is an omission at the beginning of the program which could be mistaken for a bug.

When you first use the program you are asked to type-in the present date. When you re-use the system the old date is displayed and you are asked for a new present date. If you enter a date which falls before the old date the program will accept it.

That may serve some historical purpose so far as file-handling is concerned but it could also lead to errors on the system.

The program is well-structured and the user should have no difficulty entering the data required by the computer to do its calculations.

Unlike some other accounting programs which are also written in Basic, the code which stores the password is well hidden in the program lines, although someone who knows a little about the Spectrum could probably by-pass it.

Bank Account System is good value and costs only £3. It is available from K J Gouldstone, 45 Burleigh Avenue, Wallington, Surrey, SM6 7JG.

Pretzel logic fails

IF A COMPANY has produced a compiler for the Spectrum or the ZX-81, the temptation must exist to publish some games which have been produced with the program. Softek has fallen into the trap and produced a range of arcade games, known collectively as **Ultima.**

One of the cassettes in the range, for the 16K Spectrum, is **Firebirds.** It is little more than a thinly-disguised version of Phoenix, or Winged Avenger, with two motherships which look like pretzels floating around the screen.

The game is supposed to be set in space but there is no evidence of stars and the screen is black except for the birds, motherships and other moving parts.

Unfortunately the author has not been careful to reduce the effect of colour-clash which occurs when two shapes on different-coloured squares seemingly interact. The effect is worst in the explosion sequences when you can see the outlines of the character squares in which the spaceships were designed originally.

We detected two display bugs on the screen in the second and third phases. Parts of the display disappear during play and no effort seems to have been made to circumvent the difficulty. That at least would be excusable if the effect was not so apparent.

The game could have been reasonably good if more attention had been paid to detail. Perhaps it would be a good idea for Softek to forget about compiler games and produce something in pure machine code. The games may be easy to produce but they are not so much fun to play.

Firebirds can be obtained from Softek, 329 Croxted Road, London SE24. It costs £5.95.

Program tracing

SOME microcomputers, including the Dragon and the BBC microcomputer, have a command call Trace which will run through a program displaying it line by line to show the flow of that program.

The Spectrum has no such command in its Basic language but the omission has been remedied by the release of a machine code routine, also called **Trace,** for both versions of the computer.

The routine lists a user program line by line; when it reaches a GOTO or GOSUB it will jump to the line specified by that instruction.

If Trace finds an error in a program it will inform the user and if an endless loop has been set up in a user program it will be easier to detect.

Unlike the Trace command on some computers, the routine will allow the program to run while it is executing the Trace. The run is performed in the main part of the screen area and it is useful to compare that output to the program line which is creating it at the bottom of the screen.

The routine provides an effective Trace command and is a useful debugging tool. It is easy to use and can be operated with no knowledge of machine code.

Trace can be obtained from Texgate Computers Ltd, 14 Brook Lane, Corfe Mullen, Dorset, BH21 3RD. The package costs £6.95.

Gold star for results storage

TEACHER DATA, for the 48K Spectrum, is an educational program not because it will teach pupils but because it will help teachers to grade examination results.

The program will work out all the statistics required to measure examination achievement and will even assign a grade, between A and E, to each pupil. Records of test passes and failures can be sorted separately on tape. The teacher could create separate files for each form in a school or college.

If a teacher requires a quick read-out of information, the program will create a histogram showing the results of pupils; means and standard deviation can also be calculated for further research.

The program, written by a teacher, is aimed at teachers in state schools and colleges.

It will store up to 400 names in one session, so several big classes can be dealt with at once or even for a whole year.

The calculation part of the program is menu-driven. The menu is cursor-controlled, so you have to move the cursor to the option on the list and press 's' for 'select'. The computer will give you a chance to re-select when you press 's' in case you make a mistake.

Unfortunately the cursor symbol moves down the list on its own when not under user control, so you have only a limited amount of time to press the 's' key. That is shown as a plus in the package but we regard it as a minus.

Teacher Data receives A-plus so far as we are concerned. It can be obtained from Brian Farris, 8 Thompson Road, Bolton, BL1 6DF and costs £5.20. A version for the 16K Spectrum, with scaled-down features, costs £3.80.

Pac-man gets on right track for a novel game

TRAX is a Pac-man-type game for the 48K Spectrum. The maze is a railway track and the Pac-man is a train. The ghost is played by a white killer train which will do its best to destroy you in a collision. The other obstacle is a tunnel which you must enter at the correct end, which is left, or your train will be derailed.

You may be wondering where the power pills have gone — you cannot have a game of Pac-man without power pills. They are represented by passengers who are waiting beside the track for the train to pick them up. You score points for each passenger who gets on board.

The game contains machine code but, surprisingly, that does not increase the speed of the trains and does not provide a smooth run of action during play.

The sound effects are impressive. When your train moves along the track it makes a chugging noise and when you are caught by the killer train the explosion and fire is effective.

Trax is an original and entertaining game. It should be popular with children of all ages, especially those who never owned a train set.

The package costs £5.50, which is expensive, and it can be obtained from Soft Joe's Software, Business Centre, Claughton Road, Birkenhead, Merseyside L41 6ES.

Dietron lacks weight in the slimming business

IF YOU WANT to know about your weight and the contents of the food you have been consuming, it might be easier to read a book on slimming or dieting than to use **Dietron,** for the 48K Spectrum.

The program provides all the information which you are likely to want about dieting but so does a book. The other problem with the package is the number of bugs and omissions in the system.

Our reviewer entered his weight and height and was greeted with an E Out of Data error at line 56. We were able to correct that by skipping to line 60 but the error is a bad oversight and, so near to the start of the program, raises doubts of accuracy of the program data.

The application has not been very well computerised, as height and weight data have to be entered in either inches and pounds or centimetres and kilos. That means extra calculations for the user who probably calculates weight in stones and height in feet.

The program also includes a database with information on dieting hints and a full nutritional guide. It also provides a weight calculation which will tell you how many months and weeks it will take for you to reduce to a certain weight. No effort has been made to check for unusual entries and we were informed that it would take 831 months and seven weeks to reach a weight of 0 pounds. We calculate that it would take slightly longer.

The Dietron package is ingenious but we cannot say it is particularly useful. It costs £4.50 and can be obtained from computer branches of W H Smith.

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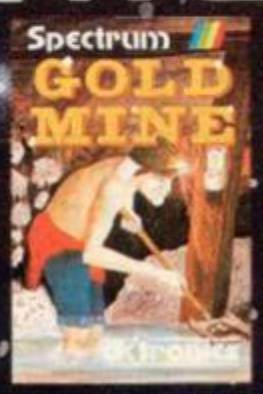

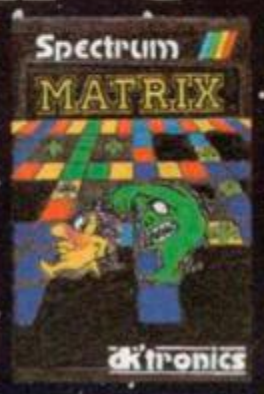

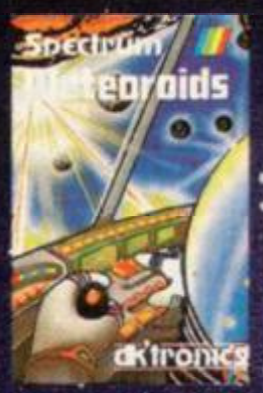

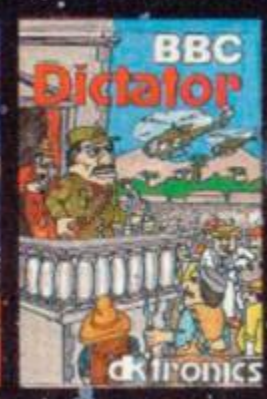

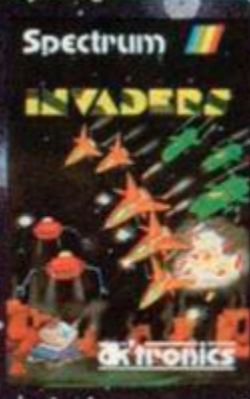

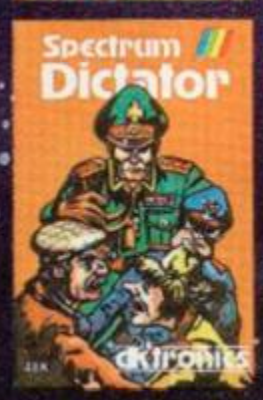

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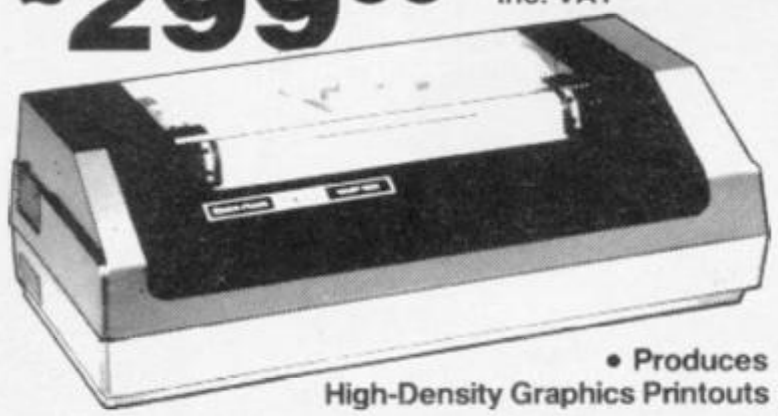

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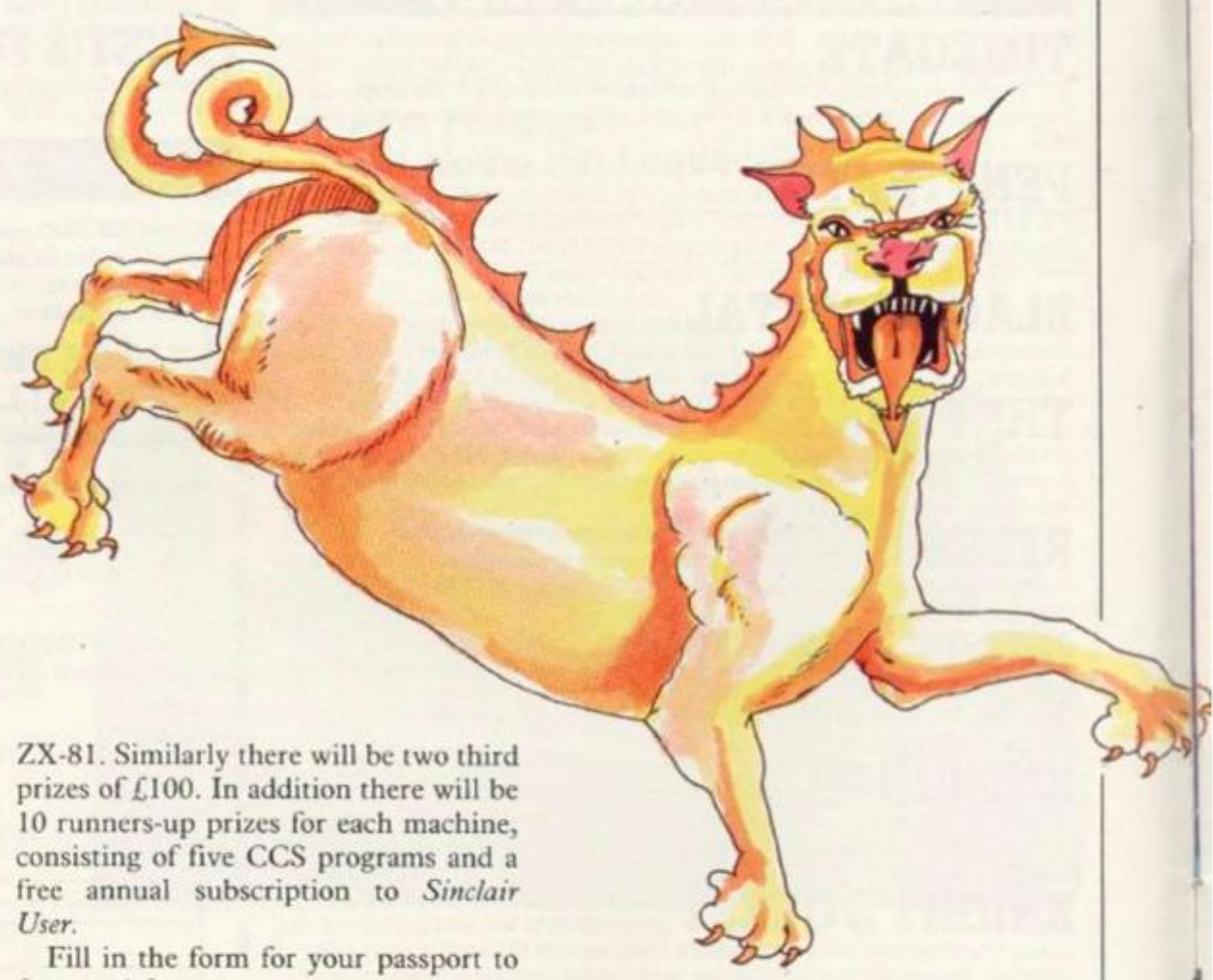

THIS IS THE LAST chance for programmers, old and new, to earn a fortune and the fame resulting from winning the Cambridge award.

With the closing date of September 20, this is the last issue of *Sinclair User* in which we will give full details and the entry form. So do not delay. Make sure that your entry is bug-free and ready to reach us by the closing date.

In this new competition, the Cambridge Trophy, sponsored jointly by *Sinclair User* and Computer Cases Simulation Ltd, we are searching for the best writers of programs for the Spectrum and ZX-81. We are offering a first prize of £1,000 plus royalties to the person who proves deserving of the title of Winner of the Cambridge Trophy 1983.

The trophy will be awarded annually with a different theme each year. In 1983 the theme is adventure and strategy games. The judges will be looking for a number of factors when making their decision. They include:

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As well as the first prize of £1,000, which can be won by programs for either the Spectrum or the ZX-81, there will be two second prizes of £250, one for the Spectrum and the other for the ZX-81. Similarly there will be two third prizes of £100. In addition there will be 10 runners-up prizes for each machine, consisting of five CCS programs and a free annual subscription to *Sinclair User*.

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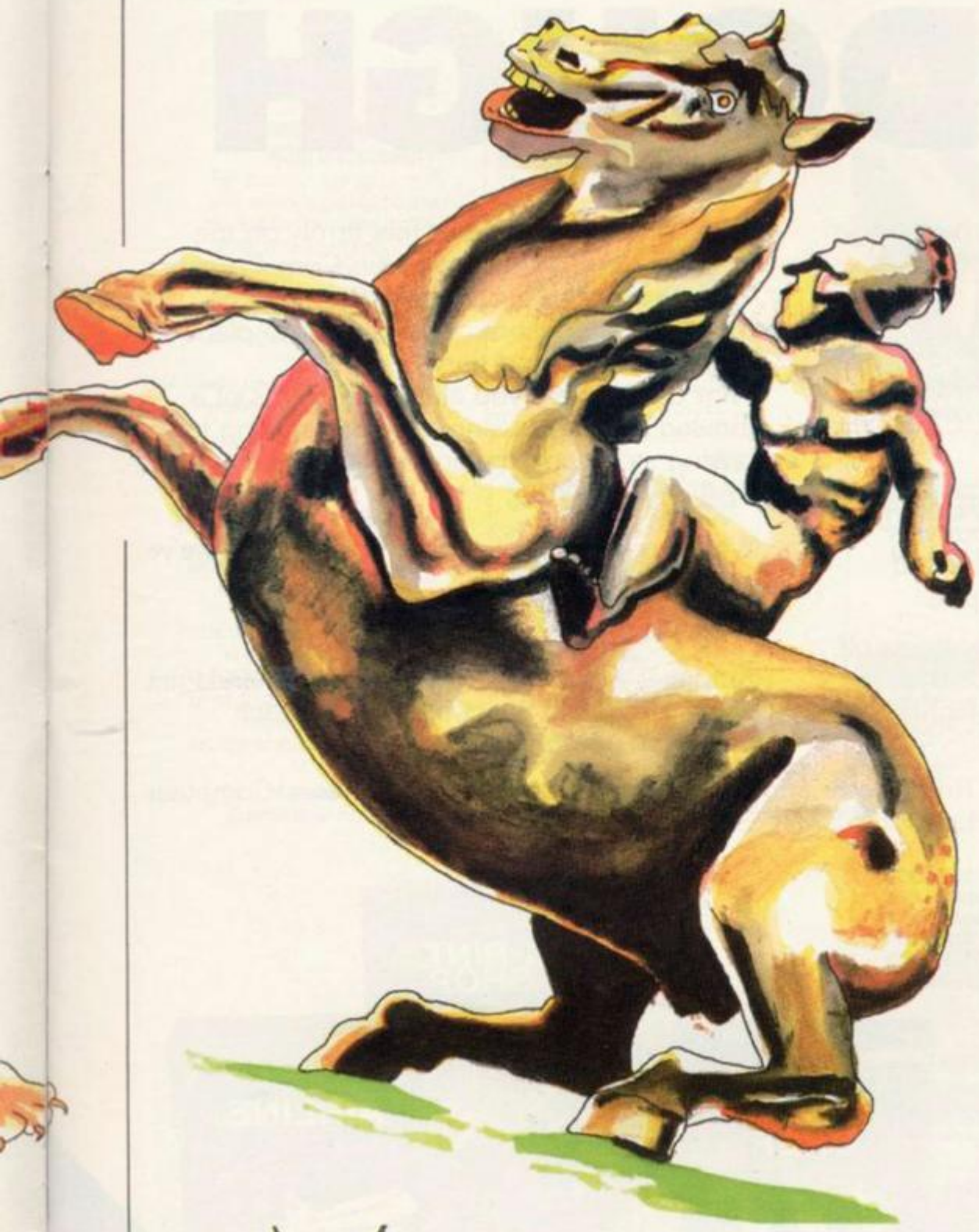
The award will be judged by three people well-known in the world of Sinclair computers—Mike Johnston, organiser of the highly-popular ZX Microfairs and consultant editor of *Sinclair User;* Trevor Toms, author of a number of books on the Spectrum and the ZX-81; and John Gilbert, *Sinclair User* software reviewer. The panel will be chaired by Nigel Clark, editor of *Sinclair User,* and Melvin Lloyd-Jones, a director of CCS.



Conditions

- Entries must be on cassette accompanied by a listing, detailed explanation of the program and an entry form. Entrants must warrant that their programs are original.
- Programs only for the Spectrum and ZX-81 will be considered.
- Entries must reach *Sinclair User* at 196-200 Balls Pond Road, London N1 4AQ, by Tuesday, September 20.
- Results will be announced at the Christmas ZX-Microfair in December.
- The entrant assigns CCS the exclusive licence with the right to sublicence, to copy, modify, sell and publish the original or modified program in any form and CCS undertakes to pay a *royalty* fee of 20 percent of the nett invoice price on the sale of such program(s) and further will pay a fee of £10 in respect of each publication of the respective program listing. CCS assigns ECC Publications the exclusive worldwide rights to publish the listings of all entries.
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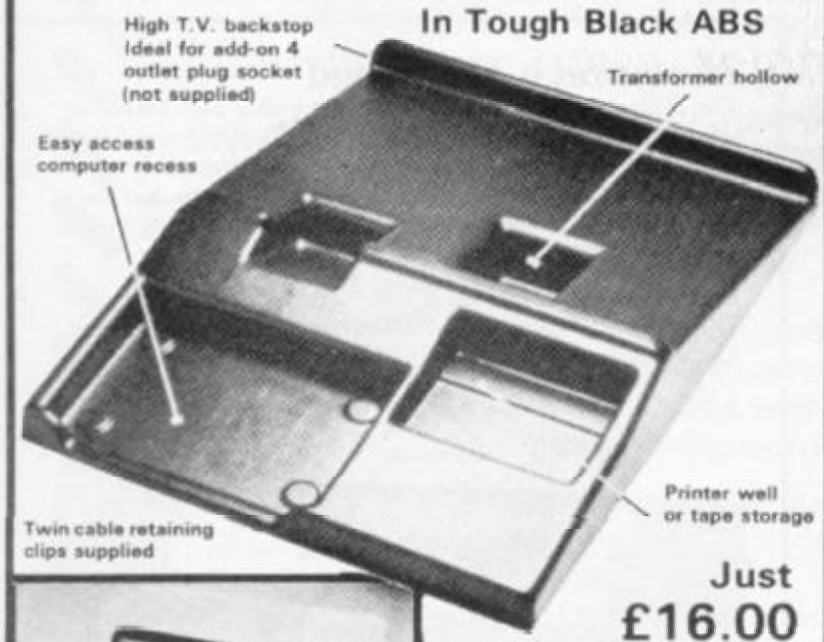
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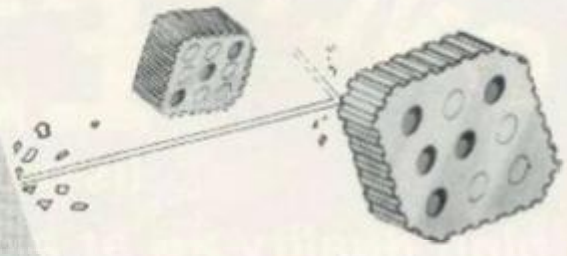

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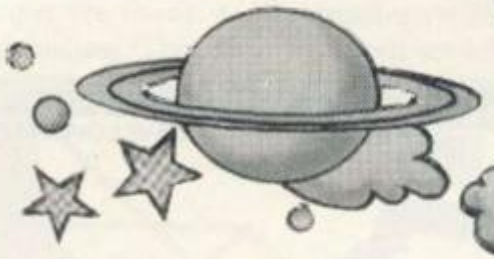

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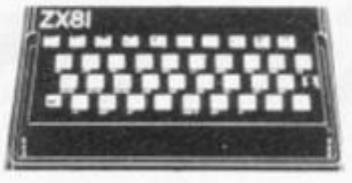


ZX81

ZX81

The technique of 3D has been growing in popularity. John Gilbert finds it is not always used in the best ways

Extra dimension adds excitement to games

THREE-DIMENSIONAL games are increasing in popularity and software houses are beginning to see that 3D techniques have great potential in a market where Space Invaders and Pac-man are rapidly becoming outdated.

Programmers are starting to use sophisticated techniques to achieve three-dimensional effects on the computer screen which seem more life-like than the two-dimensional space-battle games.

The effects are difficult to create, as the programmer is working in three planes, or directions, instead of the usual two. Most shapes are produced on the screen using X and Y co-ordinates which correspond to the flat horizontal and vertical dimensions. Three-dimensional shapes are constructed using an extra axis which, in theory, moves away from or towards the computer screen.

The new axis is called Z and it is the inclusion of that dimension which gives the three-dimensional figure its depth. When a 3D shape moves up, down and sideways it uses the X and Y dimensions. When it seems to move towards you on the screen it is using the Z axis, which exists only in theory, as the computer screen is flat and two-dimensional in shape.

J K Greye was the first company to produce games using three-dimensional effects on the ZX-81. The game was called **3D Monster Maze** and the player had to move around a three-dimensional maze to find the exit and also to evade the deadly jaws of the dinosaur which prowled around the corridors.

Even those critics who dismissed the ZX-81 as a child's toy had to admit that the program was innovative and well-presented. Monster Maze marked the rise of the use of 3D techniques on microcomputers as small as the ZX-81 and Spectrum.

After the release of 3D Monster Maze, everyone could see the potential of three-dimensional games and utility packages on small machines. Using 3D techniques programmers can portray events which seem real to computer users when they are playing a game.

Three-dimensional effects also hide the inadequacies of the computers on which games are played. The dinosaur which chased the player around a maze in the New Generation game was created using the standard ZX-81 character set. That is not noticeable when the game is being played and you could be forgiven for thinking that it used high-resolution graphics.

The use of 3D gives a game added depth but at the same time it can also be used to disguise a poor plot.

The latest game fron New Generation Software, **3D Knot,** is an example of that. While the game has a basic plot it is not deep enough when you strip away the 3D effects. That does not make it a complete failure in this case but it points to the fact that three-dimensional graphics are a means and not an end.

There are two types of three-dimensional effect. The first, and simplest to produce, is shown in the Artic Computing game for the 48K Spectrum, **Combat Zone.** The three-dimensional shapes are shown as line drawings with no shading. That means you can see all the lines of the shapes, including those which would normally be invisible if colouring and shading had been added to the figures.

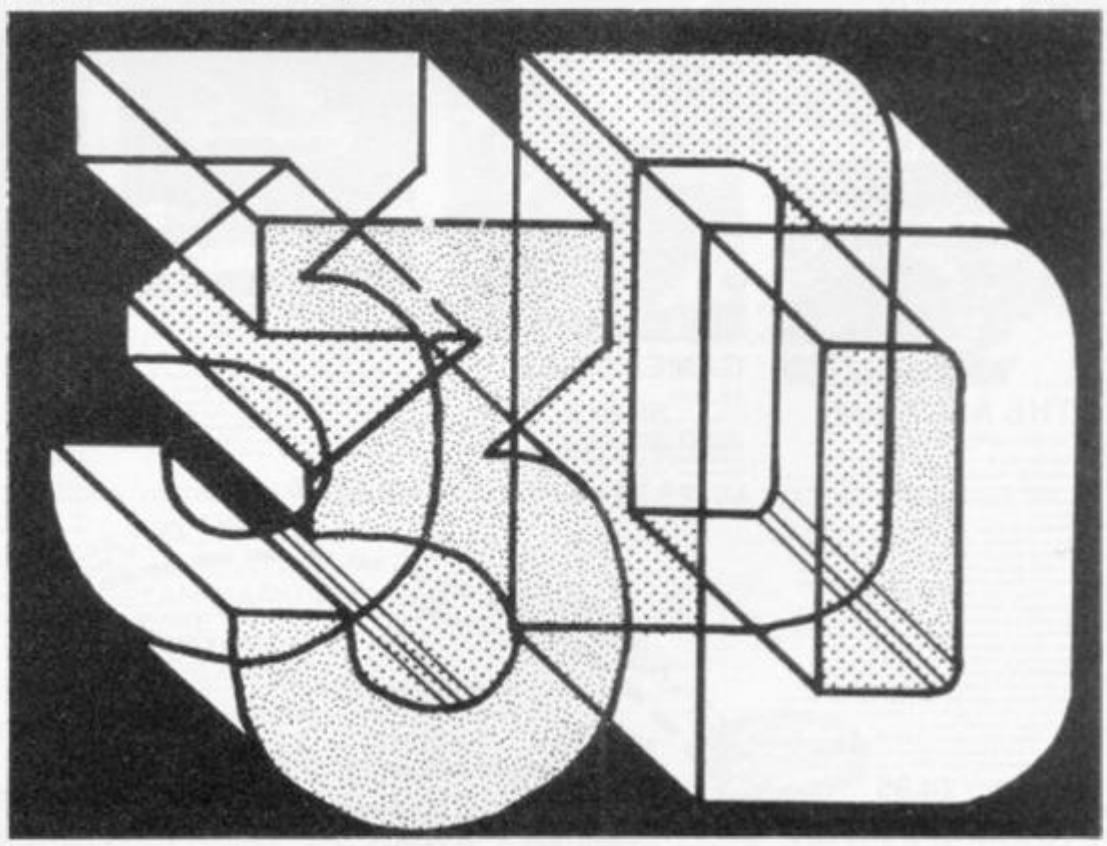
Combat Zone, like so many other pieces of software for the Spectrum, is not new in concept. It is a version of the arcade game of the same name. Although the graphics are reasonable the animation of the line-drawn shapes is very jerky.

The plot involves the player as the last of a race of tank commanders. Enemy tanks and diamond-shaped spaceships are dotted round the landscape and it is the commander's job to destroy them.

The game involves plenty of action and credit must go to the programmers who have managed to produce images which do not bend out of perspective as they move. Artic seems to have taken the easy way out, however, as the program is so slow that it must use those notorious Sinclair line-drawing routines which are in the Spectrum ROM operating system.

The Sinclair graphics routines are not known for their speed, so it would

continued on page 50



continued from page 49

have been better for Artic to write new graphics routines into the main body of the Combat Zone program.

The second type of three-dimensional image is produced reasonably well in the Quicksilva 48K Spectrum game, **Time Gate.** The graphics for that type of image are more difficult to produce, as the programmer has to shade and colour the shapes to produce a picture which looks three-dimensional.

If the shading or the shape of the image is even slightly incorrect the picture will appear to be distorted and the effect will ruin the playability of the game.

The three-dimensional effects created in Time Gate show a slight distortion of image, which can be noted when an enemy ship approaches closer to the viewing screen of the player's ship. The enemy seems to unfold its wings as it gets closer and in some cases it appears as if the fixed wings materialise from nowhere.

No doubt Quicksilva would explain that as a feature of the game but all too often features such as that are errors and are explained away too easily.

The ending of Time Gate is disappointing, as the three-dimensional technique seems to have been thrown out of the window. When you have destroyed the enemy you must approach its base planet. The planet becomes larger as if an approach is being made but the technique being used is so obvious that it is embarrassing to watch.

The program uses what again appears to be the Sinclair high-resolution routines to draw circles which start small and continue to grow bigger. As they increase in size the drawing process slows and the technique becomes even more obvious.

It would have been better to do what New Generation did with **3D Tunnel** on the Spectrum and create several separate pictures in memory to switch on to the screen one at a time in sequence. That will produce an animated effect.

If Quicksilva used that technique the planet could have been produced in high resolution at several stages of approach and would have looked like a real planet and not a rope mat.

Time Gate has its technical faults where graphics are concerned but it is playable. The 3D Tunnel from New Generation, on the other hand, has what can only be described as brilliant and imaginative graphics but it is almost impossible to play to the end.

The game takes you and your laser base through an underground tunnel inhabited by rats, spiders, toads and a very impressive tube train. Unfortunately so much memory seems to have been used to create the three-dimensional effects that the movement of the player's laser base is awkward.

More attention could have been paid to that area of the game, as movement of the base is not smooth or quick enough. That is understandable, however, as a great deal of memory has been used to produce the displays. Apart from that problem 3D Tunnel has the best graphics for a Spectrum game.

There are still very few 3D games for Sinclair machines, although those available give confidence that this sphere is developing in the proper way.

In the next few months we could see a move away from 3D arcade games and into 3D adventure games. There are already a few graphics adventures on the market but they do not use 3D.

As 3D techniques are developed, computers will be better able to produce simulations of the real world. Adventures will become more exciting and arcade games more dynamic. The 3D field is, however, just starting to develop but it has a long way to go before perfect holographic images can be produced on a small computer.

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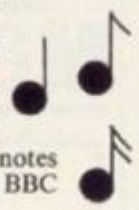

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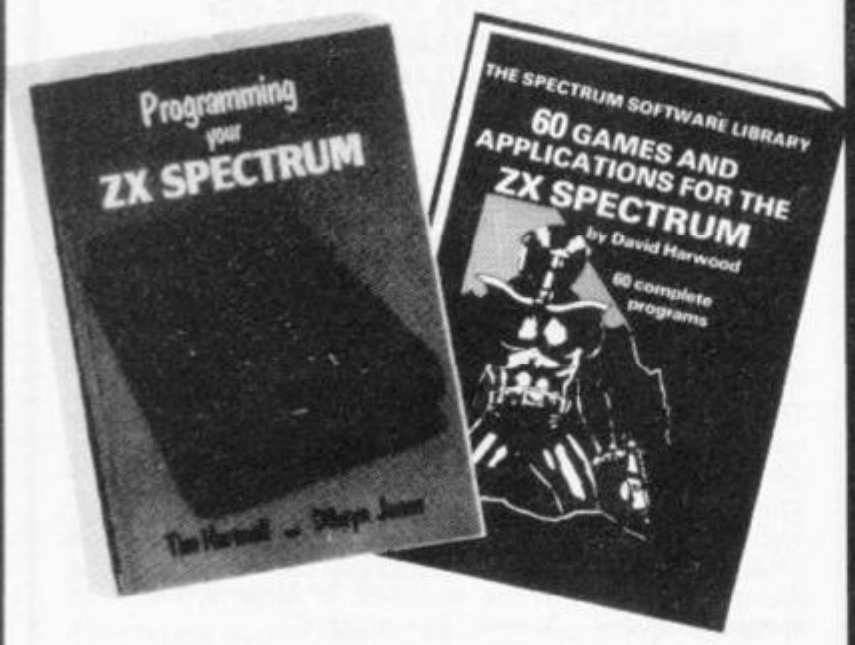
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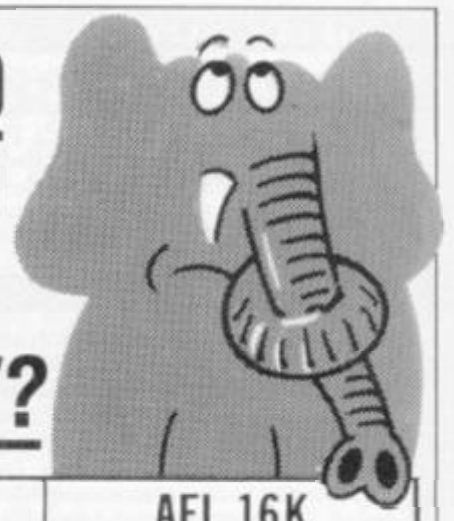

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Purchase of used Sinclairs needs much care

Stephen Adams plots the pitfalls of the used market

THERE ARE precautions which need to be taken when buying second-hand, as most equipment is sold "as seen". That means that you buy a computer with no comeback to the seller, as you determine whether anything works. Here is a simple list of things to check on ZX computers and it could well apply to the purchase of other computers.

Make sure you know what you are buying. Like buying any computer, first find what it is you are intending to buy. Read the advertisements and if they are for different models make sure you know what the differences are. Try to find someone who has one and see what they think of your intended purchase. Also ask if you can try his computer to get the feel of it.

If it has some extra items, such as a printer — usually called peripherals— make sure that you know what they are like, too, as they may be offered with the computer as a package which may not be split. There is no point in having a Sinclair printer without a computer. If you have no friend to ask, try a computer shop, explaining first that you are intending to buy a similar machine and are not just wanting to play games on the shop computer.

The price of computers is falling rapidly, especially with the introduction of new models every year. ZX-81s can be bought for as little as £20 for the basic 1K model, 16K RAM pack models about £50. Prices for Spectrum 16K and 48K models are still indeterminate as Sinclair has just lowered the price to compete with other manufacturers — but never pay more than current price for the computer.

The weekly magazines are usually the best place to look for a computer, as the time between an advertisement being received and published is shorter. Check what is being offered with the computer and is included in the price — does it include postage, for instance, if you are buying by mail order?

Software should be treated with suspicion, as it is no use without the computer and costs so much initially to buy. Usually it cannot be sold on its own, so "includes £200 of software" should be treated as unimportant to the main price of the item.

It is not a good idea to buy from shops second-hand as they have to make a profit from somewhere and that usually means you, the customer.

Is the computer in its original packaging and does it include the manual and leads which are needed to operate it? If you can visit the seller, you can check the computer and equipment yourself. Look for worn jack sockets — they are difficult to replace — which are spotted easily as the plugs move about in them. That causes bad contact and intermittent power supply, crashes or loss of LOADing or SAVEing. The edge connectors can also wear out as they are only solder-plated and can be scraped away with over-use.

'It is not a good idea to buy from shops as they have to make a profit from somewhere'

Ask to see the computer working for at least half an hour — that helps to detect over-heating problems — and try to SAVE and LOAD tapes using your own tape recorder, if you have one, at the beginning and end of the half-hour.

Check the keyboard for signs of wear and see if any of the ZX-81 keys are "dished inwards", indicating over-heavy use. Those keys will probably be the cursor keys and will be very difficult to operate. Also check the TV display to see if it wobbles about at the side; that is caused usually by a poor power pack or over-heating.

If you are allowed to remove the top, check for modifications to the board. On model 1 Spectrums there was an extra IC added which was sometimes soldered to the board, using flimsy wires; check that that IC is well-secured with tape and not wandering about the circuit board. On model two Spectrums an extra transistor has been added near the Z-80A; that is normal and fitted by Sinclair.

Sinclair printers are often offered as a package with the computer and are provided with a large power supply — 1.2 amps. Make sure you receive that if you buy a ZX-81 with printer, as otherwise neither the computer nor the printer will work with the original 750ma power supply and would damage it.

ZX-81 hardware does not usually wear out but Sinclair 16K RAM packs seem to lose their grip with age and can intensify the original RAM pack wobble experienced with them.

I hope these hints will help you when attempting to buy a good second-hand Sinclair computer.

Remember that it is pointless having a computer unless you want to do something with it. So make sure it fits the purpose you have in mind, even if it makes you decide against a Sinclair.

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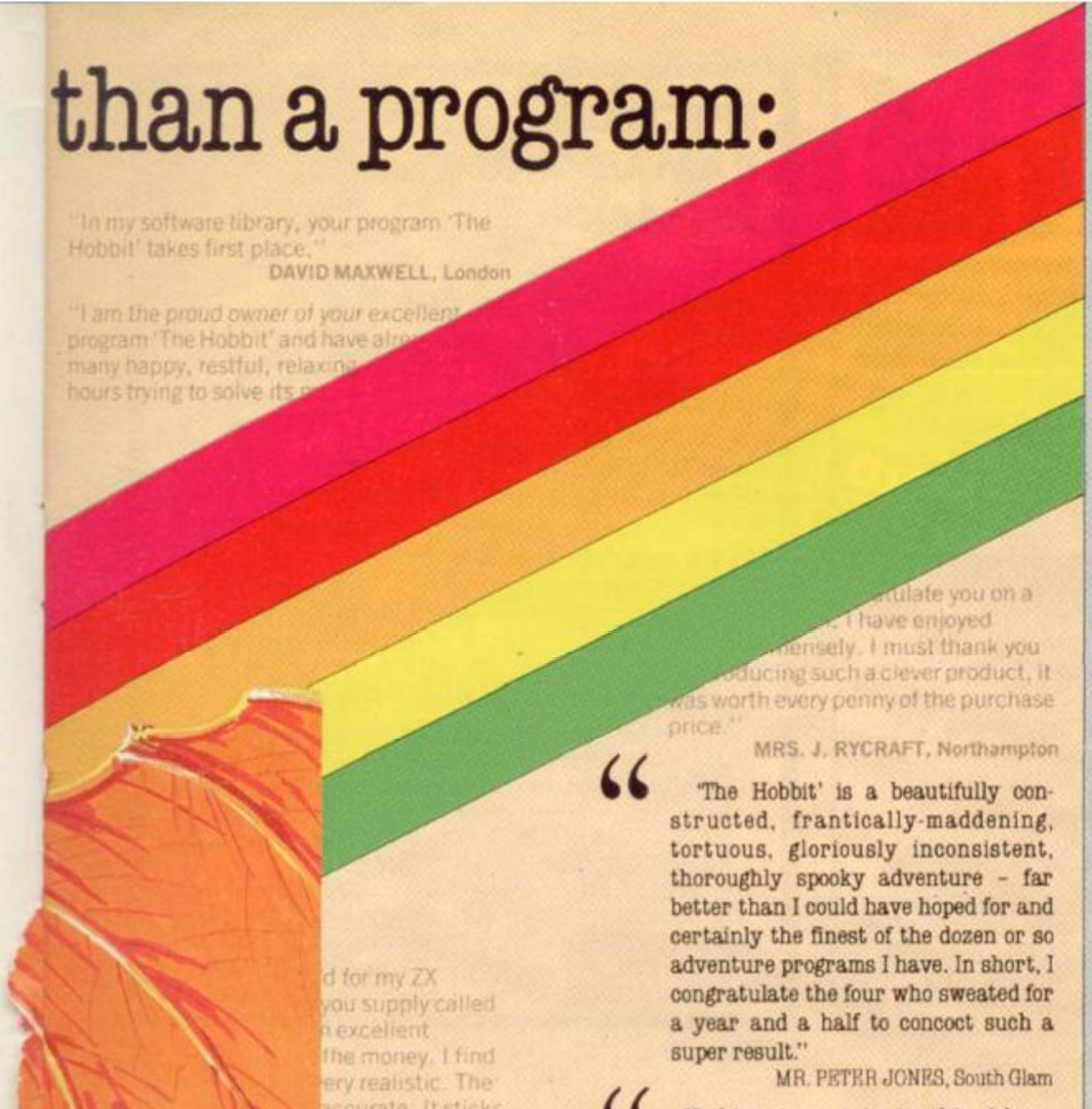

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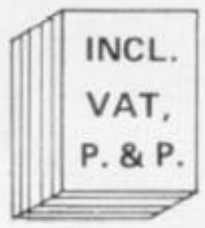

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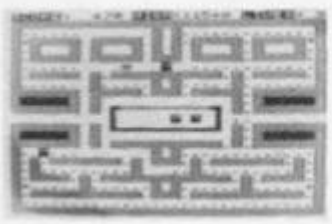

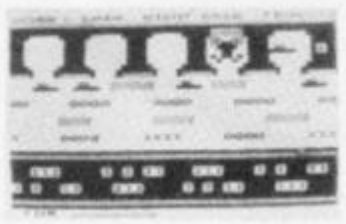

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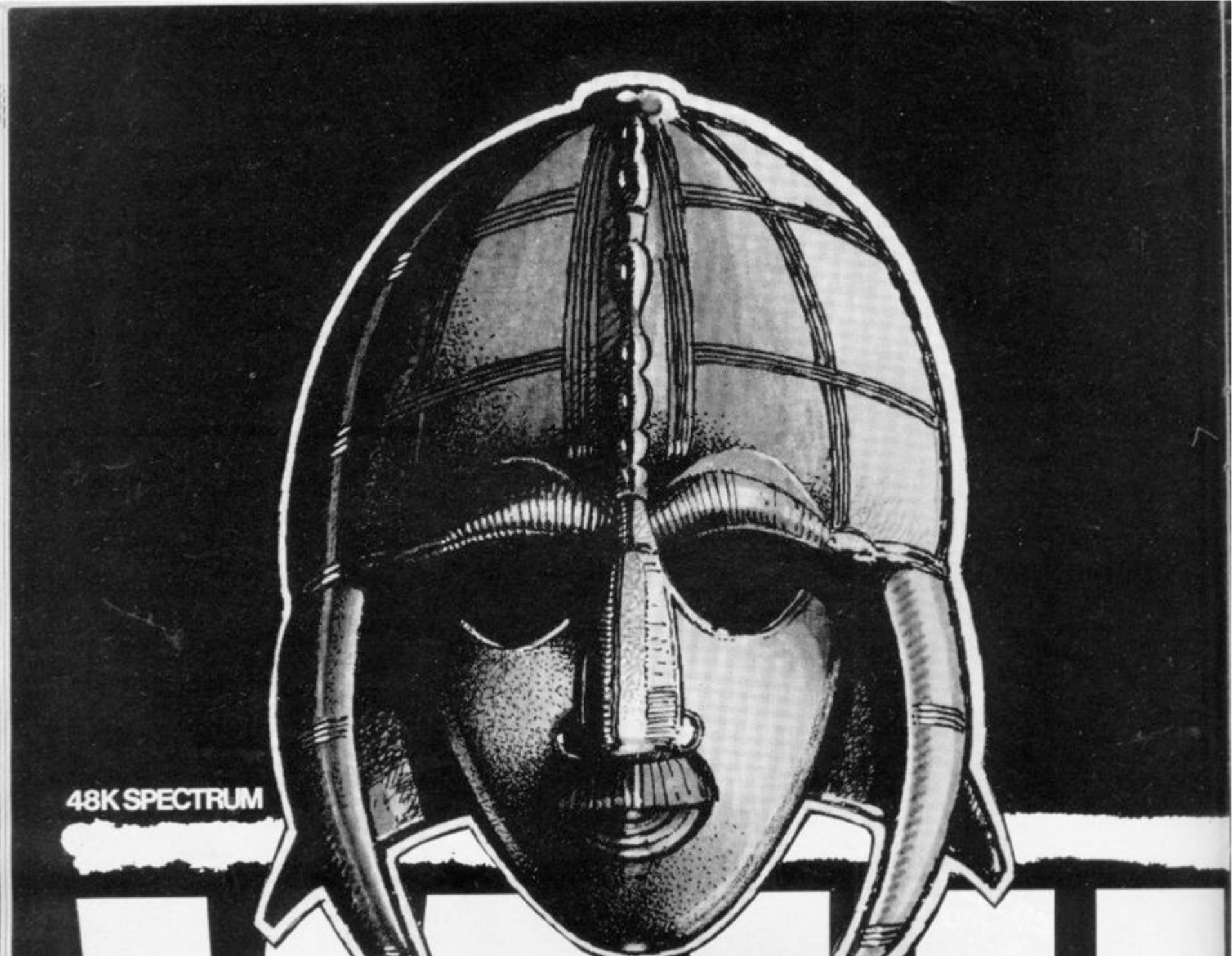

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PROGRAM PRINTOUT

WHEN THE GAME begins you are about to orbit the moon. Your orbit means that, unless you are skilful enough to balance thrust to left and right, you will move continually. That makes it very difficult to achieve the object of landing your spacecraft among the overhanging craters on the moon.

Different landing pads have different scores. A straightforward vertical descent carries only 50 points, while a landing pad at the foot of a treacherous cliff offers 80 points if you are able to reach it successfully.

Lunar Flight was written for the 16K ZX-81 by Robert Stockton of Wirral, Merseyside.

```
  1 REM main loop
  2 LET O=0
  3 GOSUB 3000
  4 GOTO 20
  5 GOSUB 200
  6 LET X=1
 10 LET S=0
 20 LET SC=100
 30 LET A=0
 40 LET B=1
 50 LET C=PEEK (PEEK 16398+256*
PEEK 16399)
 60 LET D=0
 70 PRINT AT A,B;"a"
 80 LET D=D+(INKEY$="8")-(INKEY
$="5")
 90 IF INKEY$="0" THEN LET D=0
 95 PRINT AT A,B;"a"
100 PRINT AT A,B;" "
101 IF B+D<0 THEN LET B=B+D+31
102 IF B+D>31 THEN LET B=B+D-31
110 LET B=B+D
120 IF INKEY$="6" THEN LET A=A-
2
121 IF INKEY$="9" THEN LET A=A+
1
123 LET SC=SC-1
125 IF OI=1 THEN IF A<>0 THEN L
ET A=A+1
126 IF OI=0 THEN LET A=A+1
130 PRINT AT A,B;
140 IF PEEK (PEEK 16398+256*PEE
K 16399)=CODE "(99)" THEN GOTO 1
006
145 IF PEEK (PEEK 16398+256*PEE
K 16399)=CODE "(97)" THEN GOTO 1
000
150 IF PEEK (PEEK 16398+256*PEE
```

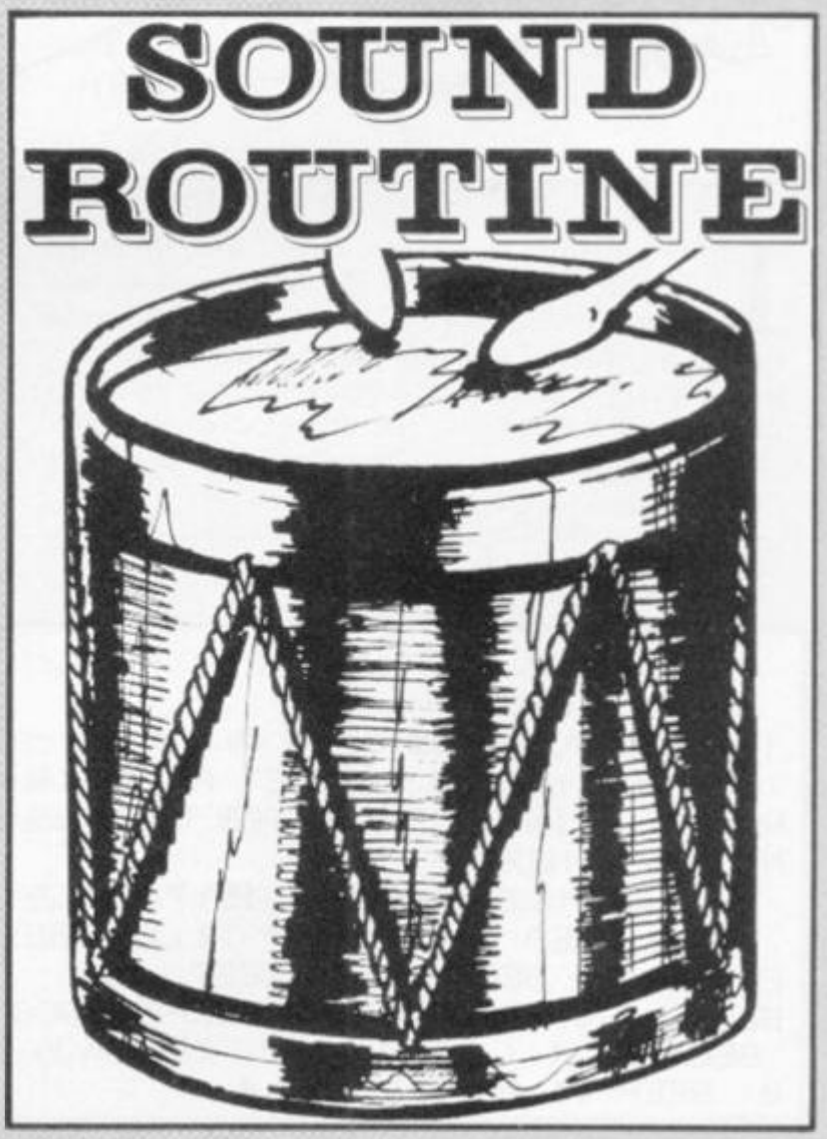
more over.

```
K 16399)=CODE "(9h)" THEN GOTO 2
000
 180 GOTO 70
 190 REM Print screen 1
 200 CLS
-201 PRINT AT 10,0;
 210 PRINT "(9h:7*sP:5*9h:5*sP:9
h)"
 220 PRINT "(2*9h:4*sP:4*9h:7*sP
:2*9h)"
 230 PRINT "(2*9h:4*sP:3*9h:7*sP
:3*9h)"
 240 PRINT "(3*9h:3*sP:2*9h:5*sP
:6*9h)"
 250 PRINT "(3*9h:2*97:4*9h:2*99
:8*9h)"
 255 PRINT "(3*9h)20(5*9h)80(7*9
h)"
 256 FOR G=1+10 TO 6+10
 257 PRINT AT G,19;"(8*9h:sP:5*9
h)"
 258 NEXT G
 259 PRINT AT 15,19;"(8*9h:99:9h
)";AT 16,19;"(7*9h)80(9h)"
 260 PRINT AT 16,0;"(19*9h)"
 270 FOR G=17 TO 16+4
 271 PRINT AT G,0;"(32*9h)"
 272 NEXT G
 290 RETURN
 999 REM landed
1000 CLS
1001 LET S=S+SC+20
1002 GOTO 1010
1006 LET SC=SC+80
1007 CLS
1008 LET S=S+SC
1010 PRINT AT 10,10;"SCORE=";S
1020 PRINT AT 11,3;"PRESS NEWLIN
E TO CONT PLAY "
1030 INPUT A$
1031 CLS
1050 GOTO 0
1060 REM crashed
2000 CLS
2010 PRINT AT 10,10;"THE END"
2030 PRINT AT 11,8;"YOU CRASHED"
2040 PRINT AT 12,8;"PRESS NEWLIN
E"
2045 PRINT AT 13,9;"SCORE=";S
2050 INPUT A$
2060 GOTO 4000
2090 REM Print screen 2
3000 PRINT AT 10,0;
3010 PRINT "(2*9h:6*sP:4*9h:5*sP
:3*9h:3*sP:3*9h:2*sP:7*9h:3*sP:7
*9h:2*sP:6*9h:3*sP:9h:4*sP:7*9h:
2*sP:4*9h:7*sP:5*9h:2*sP:9h:5*sP
:6*9h:3*sP:3*9h:4*sP:9h:3*sP:4*9
h:2*sP:9h:sP:2*9h:3*sP:5*9h:3*sP
:3*9h:4*sP:9h:3*sP:4*9h:2*sP:9h:
sP:2*9h:3*sP:5*9h:3*97:3*9h:99:4
*9h:3*99:4*9h:2*97:9h:99:2*9h:99
2*97:9h)"
3020 PRINT "(4*9h)20(isP:3*9h)80
(3*9h)80(5*9h)20(9h:isP)80(isP)2
0((9h)"
3030 PRINT "(32*9h)"
3031 FOR F=1 TO X
3032 SCROLL
3033 NEXT F
3034 LET X=X+1
3035 IF X>8 THEN LET X=8
3036 LET O=O+1
3037 IF O=10 THEN GOTO 190
3040 RETURN
3060 GOTO 5
4000 REM hall of fame and high
                  high score
4010 FOR J=1 TO 10
4020 IF S>=L(J) THEN GOSUB 5000
4030 IF S>=L(J) THEN GOTO 4200
4040 NEXT J
4055 CLS
4060 PRINT "      top 10 players"
4070 FOR J=1 TO 10
4080 PRINT J;TAB 3;L(J);AT J,10;
" ";N$(J)
4100 NEXT J
4101 PRINT
4102 PRINT "input !i! to see ins
trucions"
4110 INPUT A$
4115 IF A$<>"" THEN GOTO 6000
4120 GOTO 5
4200 CLS
4210 PRINT "  you are in the top
 ten please           enter your
name"
4220 PRINT "  no longer than twe
nty letters"
4230 INPUT N$(J)
4240 IF LEN N$(J)>20 THEN GOTO 4
200
4245 LET L(J)=S
4250 GOTO 4055
4260 REM dim arrays
4270 DIM N$(10,20)
4280 DIM L(10)
4290 GOTO 6000
4300 REM save program
4310 SAVE "LUNER LANDEr"
4320 GOTO 4260
5000 REM change top ten
5010 FOR P=9 TO J STEP -1
5020 LET L(P)=L(P+1)
5030 LET N$(P+1)=N$(P)
5040 NEXT P
5050 RETURN
6000 REM instions
6005 CLS
```

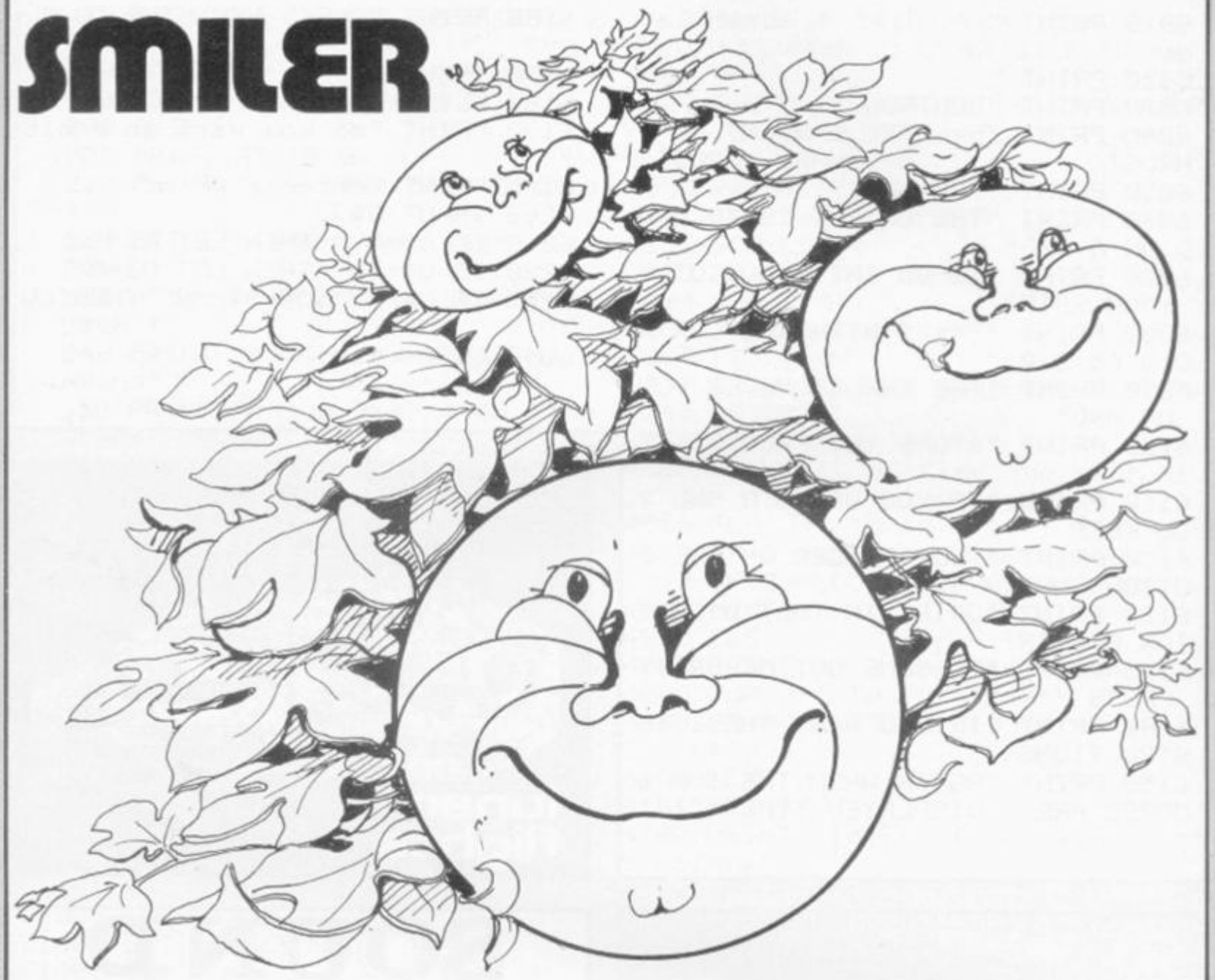
```
6010 PRINT "                lunar lan
der"
6020 PRINT
6030 PRINT "CONTROLS"
6040 PRINT "5=LEFT  8=RIGHT  0=T
HRUST              9=DOWARD THRUST"
6050 PRINT
6060 PRINT "THE OBJECT IS TO LAN
D ON A PAD"
6070 PRINT "TO DO THIS YOU GUIDE
 YOUR SHIP"
6080 PRINT """a"" WITH THE CONTR
OLS (5:8:0)"
6090 PRINT "THE THRUST MOVES YOU
 UP AND"
6100 PRINT "STOPS YOU FROM DRIFT
ING"
6110 PRINT "IF YOU USE 5:8 AND Y
OU KEEP "
6120 PRINT "YOUR FINGER ON THE B
UTTON YOU"
6130 PRINT "DRIFT IN THAT DIRECT
ION FASTER"
6135 PRINT "TO COME OUT OF ORBIT
 PRESS ""9"""
6140 PRINT "IF YOU WANT THESE IN
STRUCTIONS"
6150 PRINT "AGAIN WHEN THE TOP S
CORES ARE   DISPLAYED TYPE ""I""
"
6160 PRINT "PRESS NEW LINE TO PL
AY"
6170 INPUT A$
6180 CLS
6190 PRINT "do you want an orbit
"
6195 PRINT "enter y or n"
6200 INPUT O$
6210 IF O$="Y" THEN LET OI=1
6220 IF O$="N" THEN LET OI=0
6230 IF O$="Y" OR O$="N" THEN GO
TO 5
6240 GOTO 6180
```

THIS SHORT machine code routine can be included within programs on a 16 or 48K Spectrum. It will produce 190 sounds of varying lengths. Written by John Plunkett of Wetherby, West Yorkshire.

```
  10 CLEAR 32000
  20 FOR n=1 TO 15: READ a
  30 POKE 32000+n,a: NEXT n
  40 DATA 6,255,33,0,14,17,10,0,
43,205,181,3,16,250,201
  50 PRINT "ENTER SOUND LENGTH (
10 TO 200)"
  60 INPUT a
  70 POKE 32005,a
  80 RANDOMIZE USR 32001
```



SMILER



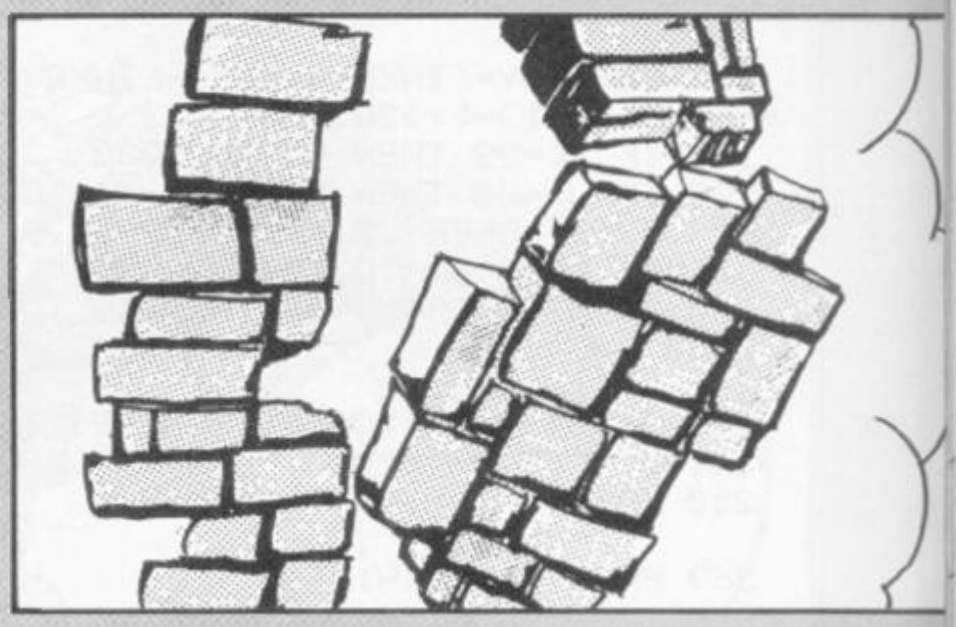
LEAD SMILER around the screen with the usual cursor keys. He must avoid the trees and eat the green squares. Once he has eaten four green squares he becomes supercharged and can eat as many trees as possible until his time (marked on the top right) runs out. If **Smiler** eats the inverse c while supercharged you gain 10 bonus points for every unit of time remaining.

A game for the 16K Spectrum by Redvers Stringer, Margate, Kent.

```
  10 BORDER 3
  50 LET L=0
  60 GO SUB 5000
  70 FOR n=1 TO 19: LET A=INT (R
ND*6): PRINT ; INK A;TAB 8*n;"bS
MILERb": NEXT n
  90 BEEP .2,7: BEEP .15,7: BEEP
 .1,8: BEEP .1,7: BEEP .1,12: BE
EP .1,11: BEEP .1,9: BEEP .3,7:
BEEP .2,5: BEEP .1,5: BEEP .2,4:
 BEEP .1,4: BEEP .1,2: BEEP .1,
0: BEEP .1,2: BEEP .3,4
  95 PAUSE 200: CLS
 100 LET V=3: LET S=0: LET J=S:
LET X=10: LET Y=15
 120 PRINT AT 0,13;"b b  "
 125 LET G=INT (RND*18)+2: LET H
=INT (RND*30)+1
 130 FOR A=1 TO 6: PRINT AT INT
(RND*18)+2,INT (RND*30)+1; INK 4
;"a": NEXT A: PAUSE 50
 135 LET R=0: LET J=0: LET Z=90
 137 GO SUB 8000
 140 PRINT AT INT (RND*18)+2,INT
 (RND*30)+1; INK 2;"c"
 145 PRINT AT X,Y;" "
 150 IF R=10 THEN PRINT AT G,H;"
": LET G=INT (RND*17)+3: LET H=
INT (RND*28)+2: LET R=0
 165 IF J<400 THEN PRINT AT X,Y;
"b"
 167 PRINT AT X,Y;" "
 170 LET X=X+(INKEY$="6")-(INKEY
$="7")+(X<2)-(X>20)
```

```
 100 LET Y=Y+(INKEY$="8")-(INKEY
$="5")+(Y<1)-(Y>30)
 190 IF Z<=89 THEN GO TO 1000
 200 IF J=400 THEN BEEP .2,14: B
EEP .2,12: BEEP .2,11: BEEP .2,9
: BEEP .8,7: GO TO 1000
 220 IF ATTR (X,Y)=58 THEN GO TO
 7000

 230 IF ATTR (X,Y)=60 THEN LET S
=S+100: LET J=J+100
 250 PRINT AT 0,0;"SCORE= ";S

 260 PRINT AT G,H;"i©"

 300 IF J<400 AND X=G AND Y=H TH
EN LET R=10: GO TO 7000
 320 IF J>=400 AND X=G AND Y=H T
HEN PRINT AT 1,10;"BONUS TIME":
FOR F=10 TO 20: BEEP .1,F: NEXT
F: GO TO 900
 600 IF J<400 THEN PRINT AT X,Y;
"b"
 620 LET R=R+1
 700 IF J>=400 THEN PRINT AT X,Y
;"b"
 800 GO TO 140

 900 LET Z=Z-1: GO SUB 8600
 910 IF Z<=1 THEN PRINT AT 1,10;
"          ": LET R=10: GO TO 1
40
 920 LET S=S+10
 930 PRINT AT 0,0;"SCORE= ";S
 940 GO TO 900
1000 IF ATTR (X,Y)=58 THEN GO TO
 2000
1010 LET Z=Z-1: GO SUB 8600

1020 IF Z=0 THEN GO TO 130
1030 GO TO 240

2000 LET Z=Z-1: LET S=S+20: GO S
UB 8600
2010 IF Z=0 THEN GO TO 130
2020 GO TO 240
5000 FOR F=0 TO 7: READ X: POKE
USR "A"+F,X: NEXT F

5100 DATA BIN 00011000,BIN 00111
100,BIN 01111110,BIN 11100111,BI
N 11100111,BIN 01111110,BIN 0011

1100,BIN 00011000
5200 FOR F=0 TO 7: READ X: POKE
USR "B"+F,X: NEXT F

5300  DATA BIN 01100110,BIN 0110
0110,BIN 0,BIN 0,BIN 11000011,BI
N 01100110,BIN 00111100,BIN 0001
1000
5400 FOR F=0 TO 7: READ X: POKE
USR "C"+F,X: NEXT F
5500 DATA BIN 00011000,BIN 00111
100,BIN 01111110,BIN 11111111,BI
N 11111111,BIN 00011000,BIN 0001
1000,BIN 00111100
5600 FOR F=0 TO 7: READ X: POKE
USR "D"+F,X: NEXT F
5700 DATA BIN 10010010,BIN 01010

100,BIN 0,BIN 11000110,BIN 0,BIN

 01010100,BIN 10010010,BIN 0
6000 RETURN
7000 PRINT AT X,Y;"d"
7100 BEEP .5,4: BEEP .5,6: BEEP
.25,7: BEEP .25,6: BEEP .5,4
7200 LET V=V-1
7205 IF V=2 THEN PRINT AT 0,13;"
b    "

7210 IF V=0 THEN GO TO 7300
7215 IF V=1 THEN PRINT AT 0,13;"
     "
7220 GO TO 140
7400 IF S>L THEN LET L=S
7500 CLS : PRINT AT 3,2;"YOUR SC

ORE ";S;AT 5,2;"HI SCORE   ";L;A
T 17,0;"DO YOU WISH TO PLAY AGAI
N (N/Y)": PRINT AT 9,9;"GAME OVE
R";AT 10,9;"GAME OVER"

7515 PAUSE 30
7517 IF INKEY$="y" THEN CLS : GO
 TO 100
7520 IF INKEY$="Y" THEN CLS : GO
 TO 100
7530 IF INKEY$="N" THEN CLS : PR
INT AT 10,13;"GOOD BYE": STOP

7540 IF INKEY$="n" THEN CLS : PR
INT AT 10,13;"GOOD BYE": STOP
7550 GO TO 7517

8500 LET Q=0
8520 PLOT 163+Q,175: DRAW 0,-7

8530 LET A=INT (RND*30): BEEP .0
08,A
8540 LET Q=Q+1

8560 IF Q=90 THEN RETURN
8590 GO TO 8520

8600 PLOT 163+Z,175: DRAW OVER 1
;0,-6: RETURN
```

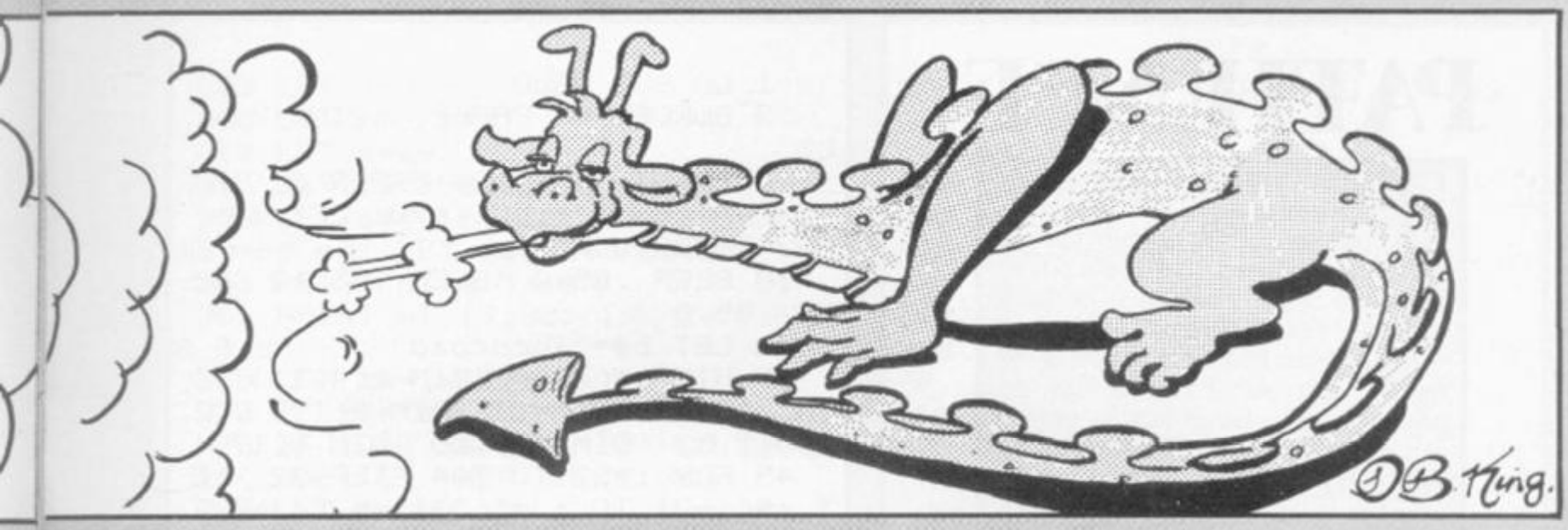
DRAGON ATTACK



SHARK CASTLE is being attacked by a group of marauding dragons. Each time a dragon hits the castle the crack in its wall will grow larger. Try to shoot down all the dragons before they can destroy your home. Move left with 'O', right with 'P' and fire with 'A'.

Created for the 16K Spectrum by Shaun Ward of Plymouth, Devon.

```
 10 LET z=23: LET sc=0: LET sh=
0: LET lv=3
 20 GO SUB 5020: GO TO 1000
 30 FOR n=14 TO 2 STEP -1: LET
y=y+1: PRINT INK i;AT x,y-1;" AB
 "
 40 PRINT INK i;AT n,lr+1;"|";A
T n+1,lr+1;" ": BEEP .004,n: BEE
P .005,n+5
 50 IF y>16 THEN LET y=0: PRINT
 AT x,16;"    ": LET z=z+1: PRINT
 AT 12,z;" ": IF z=31 THEN GO TO
 250
 55 IF SCREEN$ (n-1,lr+1)<>" "
THEN GO TO 170
 60 NEXT n: PRINT AT 2,lr+1;" "
 70 RETURN
 80 FOR n=19 TO 21: PRINT AT 16
,lr;"    "; INK 5; PAPER 1;AT n,l
r;"E";AT n-1,lr;" ": BEEP .5,-n:
 NEXT n
 90 LET z=23: CLS : OVER 1: BRI
GHT 1: FOR n=0 TO 21: PAPER (RND
*5+1): PRINT AT n,0,,: BEEP .01,
n: NEXT n
 100 PRINT INK 9;AT 7,12;"SCORE:
";AT 9,12;"LIVES:";AT 11,12;"SHE
ETS:";AT 7,18;sc;AT 9,18;lv;AT 1
1,19;sh
 110 OVER 0: BRIGHT 0: FOR n=1 T
O 500: NEXT n: RETURN
 120 FOR n=1 TO 16: LET y=y+1: P
RINT INK i;AT x,y-1;" AB "
 130 IF y>16 THEN LET y=0: PRINT
 AT x,16;"    "
 170 PRINT INK i;AT x,y-1;"***":
 BEEP .1,x: PRINT INK i;AT x-1,y
;"*": BEEP .1,-x: PRINT AT x,y-1
;"   ";AT x-1,y;" ": LET y=0: LE
T sc=sc+10
 180 PRINT AT x+1,lr+1;" "
 190 LET x=x-1: GO TO 3040
 200 PRINT AT 16,lr+1;" ": FOR n
=19 TO 21: PRINT PAPER 1;AT n,lr
;  INK 6;"F";AT n-1,lr; PAPER 1;"
 ": BEEP .5,-n: NEXT n: PRINT PA
PER 1;AT 21,lr;" "
 230 IF lv=0 THEN GO TO 0
 240 RETURN
 250 FOR n=19 TO 22: BEEP .3,n:
PRINT AT 17,n; INK i;"F": NEXT n
 270 LET a$="YOUR CASTLE HAS HAD
 IT": FOR n=1 TO LEN a$: PRINT I
NK (RND*5+1);AT 16,n;a$(n TO n):
 BEEP .1,n: NEXT n
 280 LET lv=lv-1: LET sh=sh+1: G
O SUB 90: LET z=23: GO TO 2040
1000 LET x=144
1010 FOR n=0 TO 7: READ a: POKE
USR (CHR$ x)+n,a: NEXT n: LET x=
x+1
1020 IF x>149 THEN GO TO 2040
1030 GO TO 1010
1040 DATA 64,229,255,127,63,96,6
4,160
1060 DATA 16,104,252,214,139,196
,32,80
1070 DATA 28,28,8,252,10,13,10,2
4
2010 DATA 255,129,153,157,255,25
5,255,255
2020 DATA 24,24,31,48,48,72,136,
204
2030 DATA 255,129,129,129,129,12
9,129,255
2040 IF lv<1 THEN GO TO 4050
2045 LET sh=sh+1: PAPER 0: BORDE
R 0: CLS
2060 FOR n=17 TO 21: PRINT INK 3
;AT n,0;"FFFFFFFFFFFFFFFFFFFF": B
EEP .01,n: NEXT n
2070 FOR n=17 TO 21: PRINT INK 3
;AT n,23;"FFFFFFFFF": BEEP .01,n
: NEXT n
```




```
2080 FOR a=24 TO 31: FOR n=16 TO
 7 STEP -1: PRINT INK 5;AT n,a;"
F": NEXT n: BEEP .01,a: NEXT a:
PRINT AT 6,23; INK 5;"FFFFFFFFF"
;AT 5,22;"FFFFFFFFFF"
2090 PRINT INK 5;AT 4,21;"F F F
F F F";AT 3,21; INK 6;" ";AT 2,2
1;" ";AT 2,20; INK 2; PAPER 5; F
LASH 1;"D"
3000 FOR n=18 TO 21: PRINT INK 1
;AT n,19;"(4*isP)": BEEP .5,n: N
EXT n
3010 PRINT INK (RND*5+1); PAPER
9; FLASH 1;AT 0,0;"(96:93:96:93:
96) KILLER-SHARK CASTLE (i96:93:
i96:93:i96)"
3020 LET y=1
3030 LET lr=4
3040 LET x=INT (RND*9+2): LET i=
INT (RND*5+1)
3045 IF z>30 THEN GO TO 250
3046 PRINT AT 12,z;" "
3050 LET lr=lr+(IN 57342=254 OR
lr<1)-(IN 57342=253)
3060 IF lr>18 THEN LET lv=lv-1:
GO SUB 80: GO TO 2040
3070 PRINT INK 5;AT 16,lr;" E "
3080 PRINT INK i;AT x,y; INK 5;"
 AB ": BEEP .002,x
3090 LET y=y+1
4000 IF y>16 THEN LET y=0: LET z
=z+1: PRINT AT x,16;"   ": GO TO
 3040
4010 IF IN 65022=254 THEN GO SUB
.30
4020 PRINT PAPER i; INK 9;AT 17,
0;"SCORE:";sc
4040 GO TO 3050
4050 BORDER (RND/5): PAPER 0: CL
S
4060 PRINT AT 0,0; INK RND*5;"SC
ORE:";sc;AT 0,13;"HIGH-SCORE:";h
s
4070 PRINT AT 10,7; FLASH 1; INK
 RND*5; PAPER 9;"ANOTHER GO? (Y/
N)"
4080 IF INKEY$="y" THEN LET sh=0
: LET sc=0: LET lv=3: GO TO 2045
4090 IF INKEY$="n" THEN RANDOMIZ
E USR 0
5000 BEEP .01,INT (RND*50)
5010 GO TO 4080
5020 PAPER 1: BORDER 1: CLS
5030 PRINT FLASH 1; INK 2; PAPER
 5;AT 0,0;"(32*i95)";AT 21,0;"(3
2*95)"
5040 FOR n=1 TO 20: PRINT FLASH
1; INK 2; PAPER 0;AT n,0;"(93)";
AT n,31;"(i93)": BEEP .01,n: NEX
T n
5050 PRINT FLASH 1; INK 3; PAPER
 6;AT 2,4;"WELCOME TO SHARK CAST
LE."
5060 PRINT INK 3;AT 4,1;"YOU MUS
T STOP THE DRAGONS FROM";AT 5,1;
 INK 2;"DESTROYING YOUR CASTLES.
";AT 6,1; INK 3;"YOU DO THIS BY
FIRING AT THEM.";AT 7,1; INK 4;"
IF YOU FALL IN THE MOAT,OR ALL";
AT 8,1; INK 5;"YOUR BRICKS ARE T
AKEN THEN YOU";AT 9,1; INK 6; FL
ASH 1;"LOSE A LIFE."
5070 PRINT INK 0; PAPER 5;AT 11,
10; FLASH 1;"CONTROLS:-";AT 13,5
;"LEFT=O";AT 13,19;"RIGHT=P";AT
15,12;"FIRE=A"
5080 PRINT INK 2; PAPER 6; FLASH
 1;AT 18,6;"PRESS ENTER TO PLAY"
5085 BEEP .01,INT (RND*10)
5090 IF INKEY$=(CHR$ 13) THEN RE
TURN
5100 BEEP .01,INT (RND*40)
5110 GO TO 5085
```

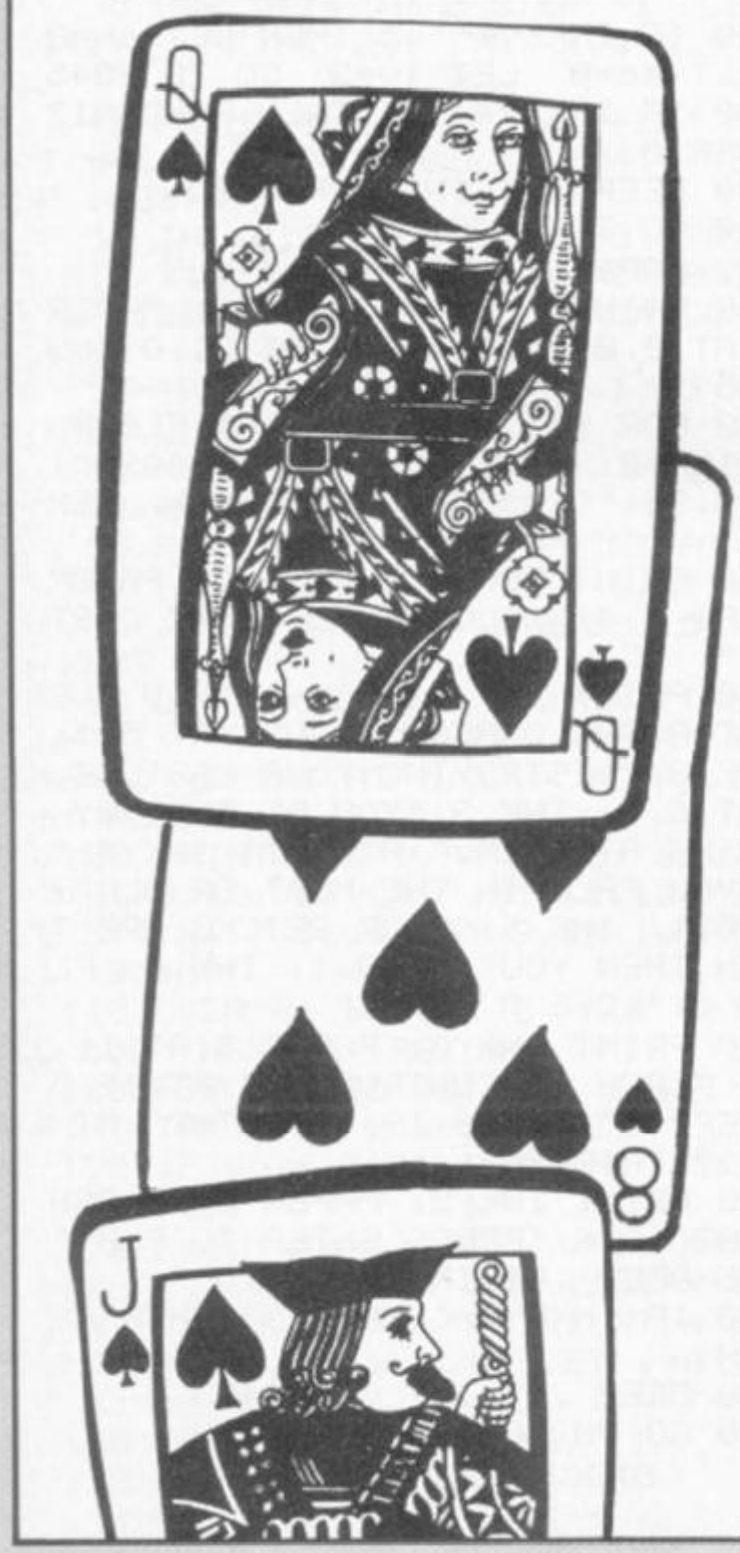
PATIENCE

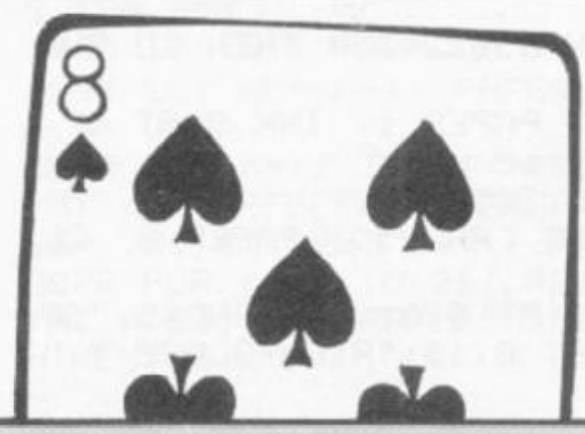
THIRTY-FIVE CARDS are arranged in seven rows of five on the left of the screen. On the right is an upturned card and a pile of cards face down. The aim is to finish with the 35 cards piled on the right.

A card at the bottom of a row may be removed and placed on the right by pressing the number of its row, so long as it is next in number to the card on the right. Thus a five or a seven may be placed on a six, a queen on a king, or a two on an ace. If no other move is possible, another of the cards on the right can be upturned by pressing "S".

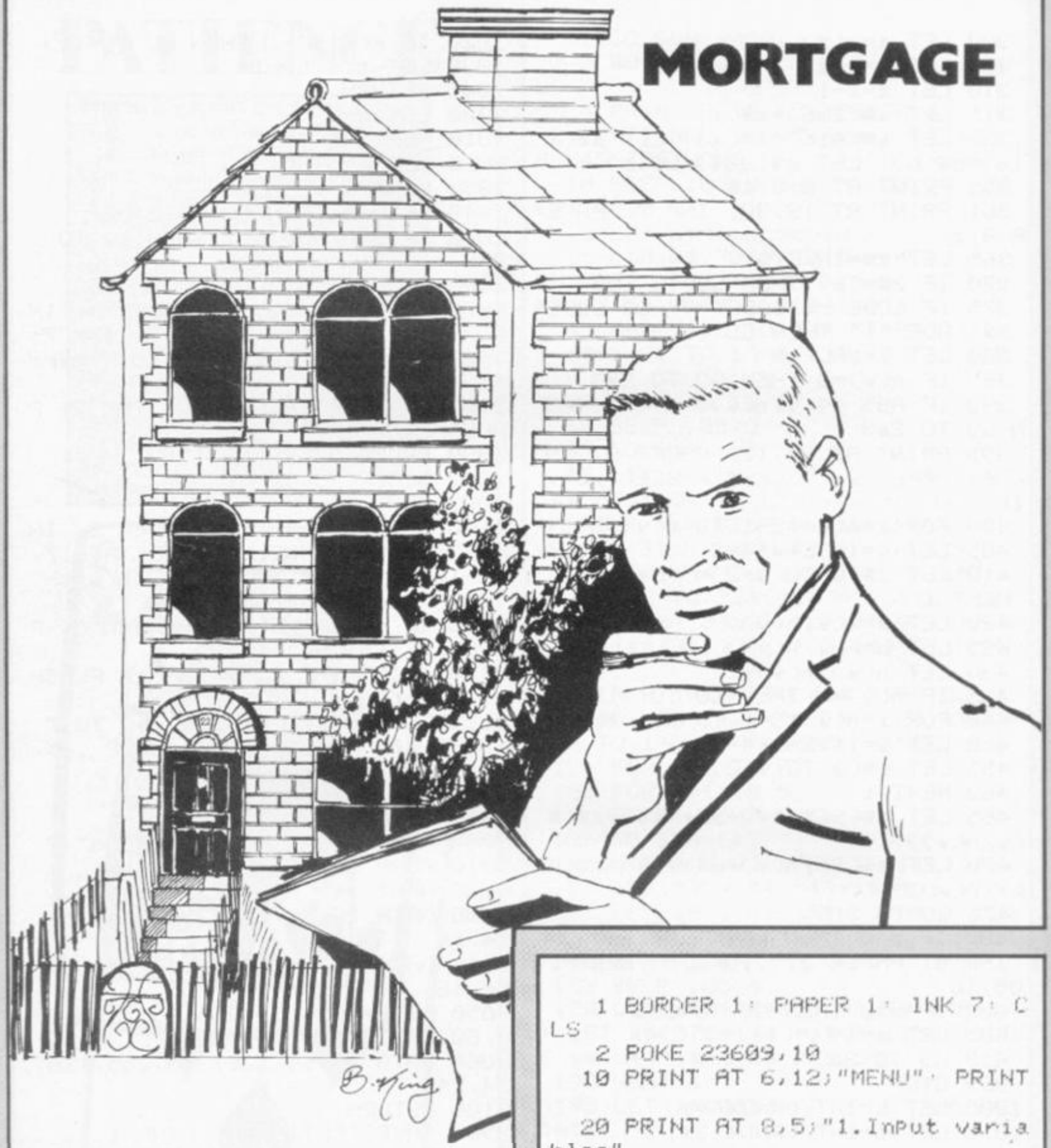
Patience was written for the 16K Spectrum by Andrew Price of West Bromwich, West Midlands.

```
  1 GO SUB 9000
  3 BORDER 0: PAPER 7: INK 0: C
LS
  4 PRINT AT 8,12; PAPER 6; INK
 2;"PATIENCE": LET e=0: LET a$="
A23456789TJQK"
 10 BEEP .05,0: BEEP .05,10: BE
EP .05,0
 13 LET b$="abcdcbad"
 15 DIM s$(704): DIM c(4,13): D
IM n(7): LET z=17: DIM v(17): DI
M p(7,5): DIM q(7,5): DIM w(17)
 45 FOR i=32 TO 704 STEP 32: LE
T s$(i-31 TO i)="("+32*isP+")": NEXT
 i
 60 FOR i=1 TO 17
 62 BEEP .05,0
 65 GO SUB 1e3
 70 LET v(i)=s: LET w(i)=t: LET
 s$(32*i+34 TO 32*i+60)="("+3*sP+i
sP+3*sP+isP+3*sP+isP+3*sP+isP+3*
sP+isP+3*sP+isP+3*sP+")": NEXT i
 95 FOR i=4 TO 13 STEP 3: LET s
$(32*i+2 TO 32*i+28)="("+3*193+isP
+3*193+isP+3*193+isP+3*193+isP+3
*193+isP+3*193+isP+3*193+")": NEXT
 i
 105 FOR i=286 TO 414 STEP 32: L
ET s$(i TO i+2)="   ": LET s$(i+
288 TO i+290)="("+3*96+")": NEXT i
 125 FOR i=1 TO 7
 130 FOR j=1 TO 5
 132 BEEP .05,2
 135 GO SUB 1e3
 140 LET p(i,j)=s: LET q(i,j)=t:
 LET s$(j*96+i*4-34)=a$(q(i,j))
 155 LET s$(j*96+i*4-2)=b$(p(i,j
))
 160 NEXT j
 162 BEEP .05,4
 170 LET s$(i*4+639)=CHR$ (48+i)
: LET s$(576+i*4)=a$(q(i,5)): LE
T s$(544+i*4)=b$(p(i,5))
 190 NEXT i
 195 LET s$(255)="F": LET s$(543
)="s"
```





```
 300 LET a=w(z)
 305 LET b=v(z)
 310 LET z=z-1
 315 LET s$(286)=a$(a)
 320 LET s$(416)=a$(a): LET s$(3
18)=b$(b): LET s$(384)=b$(b)
 355 PRINT AT 0,0;s$
 361 PRINT AT 19,30; INK 7; PAPE
R 0;z
 365 LET z$=INKEY$
 370 IF z$="s" THEN GO TO 600
 375 IF CODE z$>CODE "7" OR CODE
 z$<CODE "1" THEN GO TO 365
 380 LET y=VAL z$
 385 IF n(y)=0 THEN GO TO 2e3
 390 IF ABS (q(y,n(y))-a)<>1 THE
N GO TO 2e3
 395 PRINT AT 21,13; PAPER 0; IN
K 6; PAPER 2;"..OK..": BEEP .05,
10
 400 FOR i=n(y)*3-1 TO n(y)*3+3
 405 LET g=i*32+y*4-2
 410 LET s$(g TO g+2)="(3*1sP)":
 NEXT i
 420 LET a=q(y,n(y))
 425 LET b=p(y,n(y))
 430 LET n(y)=n(y)-1
 435 IF n(y)=0 THEN GO TO 315
 440 FOR i=n(y)*3+1 TO n(y)*3+3
 450 LET g=i*32+y*4-2
 455 LET s$(g TO g+2)="    "
 460 NEXT i
 465 LET s$(96*n(y)+96+y*4)=a$(q
(y,n(y)))
 470 LET s$(96*n(y)+64+y*4)=b$(p
(y,n(y)))
 475 GO TO 315
 600 IF z>0 THEN PRINT AT 21,13;
 INK 6; PAPER 2;"..OK..": BEEP .
05,10
 602 IF z>0 THEN GO TO 300
 605 LET e=1
 610 GO TO 2e3
 999 STOP
1000 LET s=INT (RND*4+1)
1010 LET t=INT (RND*13+1)
1020 IF c(s,t)=1 THEN GO TO 1e3
1030 LET c(s,t)=1
1040 RETURN
2000 LET o=0
2010 FOR i=1 TO 7
2020 LET o=o+n(i)
2030 NEXT i
2040 IF o=0 THEN GO TO 2100
2050 IF z=0 AND e=1 THEN GO TO 2
070
2060 GO TO 350
2070 PRINT AT 15,12; PAPER 2; IN
K 7;"HARD  LUCK";AT 17,7; INK 7;
 PAPER 2;"You lost by ";o;" card
";
2080 IF o<>1 THEN PRINT INK 7; P
APER 2;"s"
2090 PAUSE 0: PAUSE 150
2092 CLS
2093 RUN
2100 PRINT AT 15,12; PAPER 2; IN
K 6; FLASH 1;"WELL  DONE";AT 17,
0; INK 6; PAPER 2;"You won with
";z;" stock card";
2110 IF z<>1 THEN PRINT INK 6; P
APER 2; FLASH 1;"s"
2120 PRINT INK 6; PAPER 2; FLASH
 1;" left"
2125 FOR m=1 TO 2: FOR n=0 TO 7:
 BEEP .05,n: BORDER n: BEEP .05,
-n: NEXT n: NEXT m
2130 GO TO 2090
9999 STOP
9000 FOR a=USR "a" TO USR "d"+7
9010 READ user: POKE a,user
9020 NEXT a
9030 DATA 16,56,124,254,254,254,
84,16
9040 DATA 16,56,124,254,254,124,
56,16
9050 DATA 102,231,255,255,255,12
6,60,24
9060 DATA 24,60,126,255,255,126,
24,24
9100 RETURN
9900 SAVE "PATIENCE" LINE 1
```



ENTER the principal of the mortgage you wish to calculate, the interest rate, and the number of years over which it must be repaid. The computer will then calculate your monthly repayments for that time, the amount of money remaining to be repaid each month, and will draw a graph of payments.

Mortgage was written for the 48K Spectrum by D Barton of Keighley, West Yorkshire.

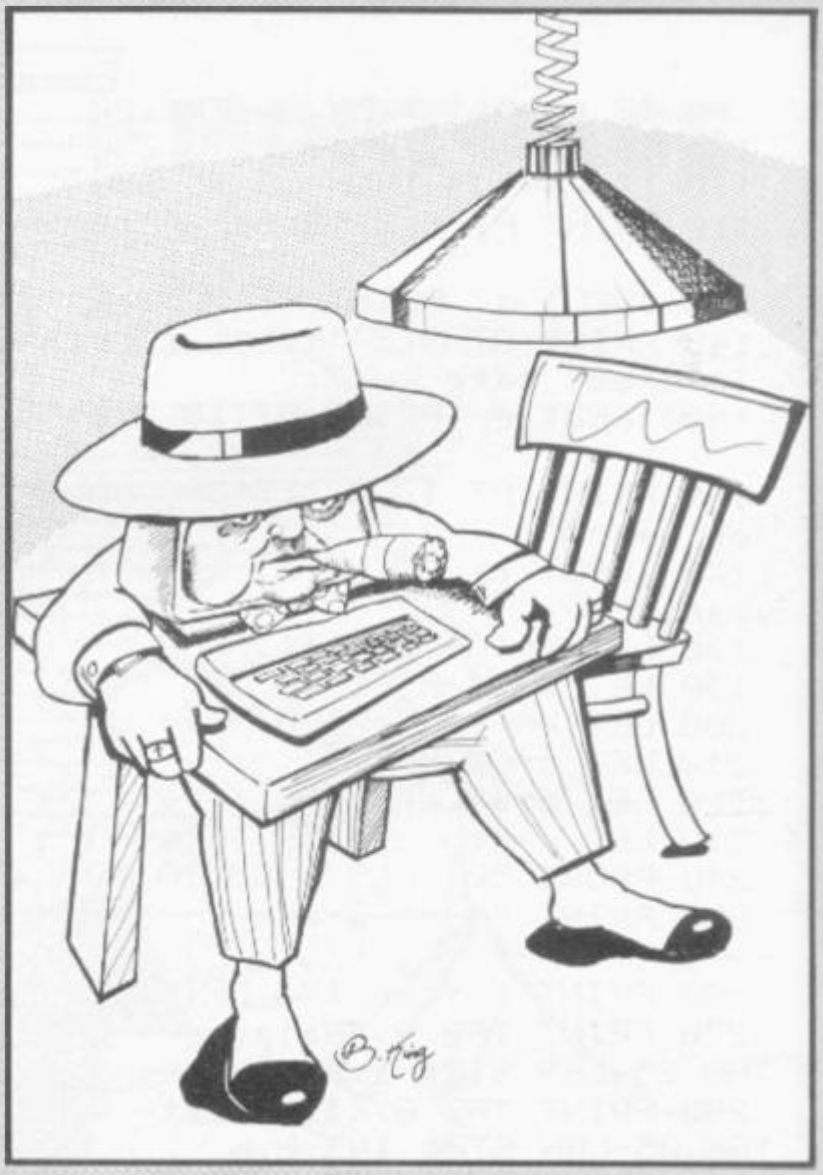
```
  1 BORDER 1: PAPER 1: INK 7: C
LS
  2 POKE 23609,10
 10 PRINT AT 6,12;"MENU": PRINT

 20 PRINT AT 8,5;"1.Input varia
bles"
 30 PRINT AT 10,5;"2.Mortgage C
alculation"
 40 PRINT AT 12,5;"3.Graph Of R
esults"
 50 PRINT AT 15,2;"Input Code N
umber To Continue";AT 16,5;"(OP1
 must be completed          be
fore OPs2 and 3)"
 60 INPUT P$
 70 IF P$<>"1" AND P$<>"2" AND
P$<>"3" THEN GO TO 60
 80 CLS
```

```
 90 IF p$="1" THEN GO TO 120
 100 IF p$="2" THEN GO TO 250
 110 IF p$="3" THEN GO TO 550
 120 PRINT AT 6,2;"Enter Princip
le                    :"
 130 INPUT a: PRINT AT 7,3;"£";a
 140 PRINT AT 9,2;"Enter current
 Interest rate       :"
 150 INPUT e: PRINT AT 10,3;e;"%
"
 160 PRINT AT 12,2;"Enter number
 of years             :"
 170 INPUT n: PRINT AT 13,3;n;".
years"
 180 LET h=((e/100)+1)^n
 190 LET j=(1/h)-1
 200 LET k=(j/(-e/100))/a
 210 LET c=(1/k)/12
 220 LET b=a*(e/100)
 230 LET x=a+b
 240 PAUSE 50: CLS : GO TO 10
 250 PRINT "--------------------
------------"
 260 PRINT " Year 1": PRINT
 270 PRINT TAB 8;"Balance - £";
TAB 25-LEN STR$ a;a
 280 PRINT TAB 8;"Interest- £";
TAB 25-LEN STR$ INT b;b
 290 PRINT TAB 18;"--------"
 300 PRINT TAB 18;"£";TAB 25-LE
N STR$ INT x;x
 310 PRINT
 320 FOR g=1 TO n
 330 FOR m=1 TO 12
 340 IF INKEY$<>"" THEN PAUSE 30
0
 350 PRINT TAB 6-LEN STR$ m;m;TA
B 8;"£ ";INT (c*100)/100;TAB 18;
"- ";TAB 25-LEN STR$ INT (x-c);1
NT ((x-c)*100)/100
 360 LET x=x-c
 370 IF x<=0 THEN INPUT p$: CLS
: PAUSE 50: GO TO 10
 380 NEXT m
 390 LET z=(e/100)*x
 400 LET y=x+z
 410 PRINT
 420 PRINT "--------------------
------------"
 430 PRINT "--------------------
------------"
 440 PRINT " Year ";g+1: PRINT
 450 PRINT TAB 8;"Balance - £";
TAB 25-LEN STR$ INT x;INT (x*100
)/100
 460 PRINT TAB 8;"Interest- £";
TAB 25-LEN STR$ INT z;INT (z*100
)/100
 470 PRINT TAB 18;"----------"
 480 PRINT TAB 18;"£";TAB 25-LE
N STR$ INT y;INT (y*100)/100
 490 PRINT
 500 LET x=y
 510 NEXT g
 520 CLS
 530 GO TO 10
 540 REM graph
 550 DIM y$(21)
 560 LET y$="!!!!! Pounds !!!!!!
!!"
 570 FOR i=1 TO LEN y$
 580 PRINT AT i,0;y$(i)
 590 NEXT i
 600 PRINT AT 21,0;"------------
 Years ------------"
 610 LET b=a*(e/100)
 620 LET l=8
 630 LET x=a+b
 640 LET z=x*(1+(e/100))
 650 IF z<8000 THEN LET q=46
 660 IF z>=8000 AND z<14000 THEN
 LET q=80
 670 IF z>=14000 AND z<20000 THE
N LET q=120
 680 IF z>=20000 AND z<26000 THE
N LET q=150
 690 IF z>=26000 AND z<32000 THE
N LET q=185
 700 FOR g=1 TO n
 710 FOR m=1 TO 12
 720 IF INKEY$<>"" THEN PAUSE 30
0
 730 LET l=l+.75
 740 PRINT AT 1,4;"£";TAB 11-LE
N STR$ INT x;INT (x*100)/100
 750 PLOT l,x/q
 760 LET x=x-c
 770 IF x<=0 THEN GO TO 830
 780 NEXT m
 790 LET z=(e/100)*x
 800 LET y=x+z
 810 LET x=y
 820 NEXT g
 830 PRINT AT 1,4;"
"
 840 PRINT AT 4,16;"Years: ";n;AT
 5,17;"Loan: ";a;AT 6,18;"Int: ";
e;AT 6,24;"%"
 850 INPUT "Copy? Y/N ";p$
 860 IF p$="Y" OR p$="y" THEN PR
INT AT 1,4;"          "
 870 IF p$="Y" OR p$="y" THEN CO
PY
 880 CLS
 890 GO TO 10
```

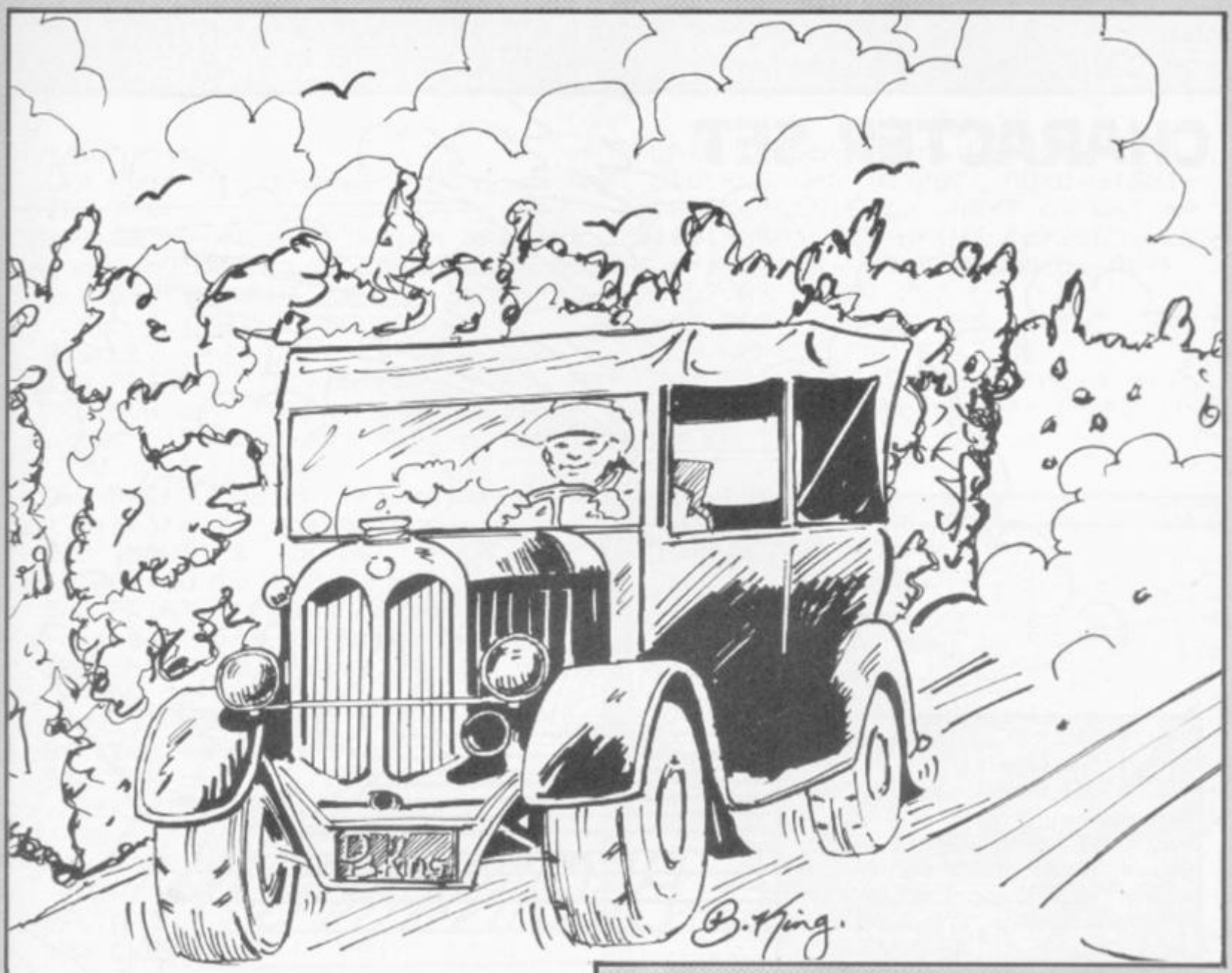
THIRTY ONES

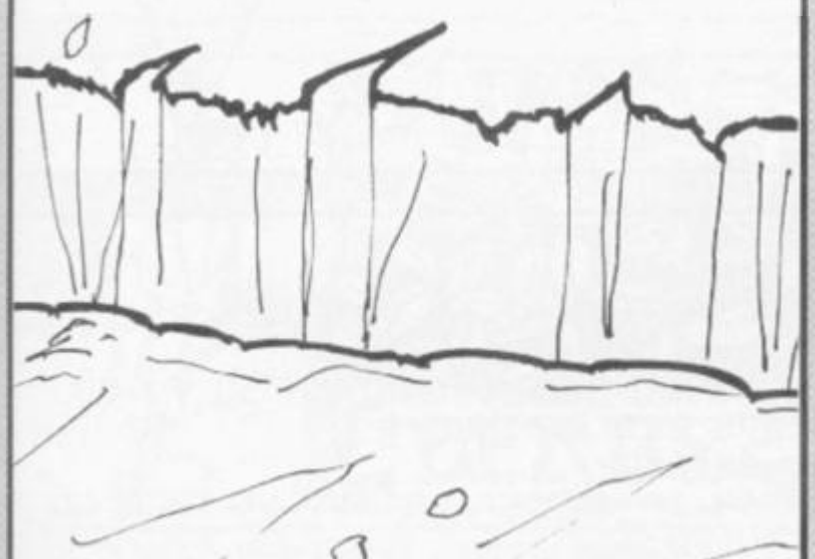
WHEN START? is displayed enter M if you wish to play first or Y if you would prefer the computer to start. A set of counters will then be displayed, four of each number from one to six. You and the computer take turns in removing a number to add to the total. The winner is the player who brings the total to 31.

Written for the 16K ZX-81 by J. H. Entwistle of Cheltenham, Gloucestershire.




```
 8 CLS
 9 PRINT "START?"
10 INPUT A$
11 LET R=31
12 LET M=7
13 DIM D(6,4)
14 LET T=0
15 CLS
19 FOR N=1 TO 6
20 PRINT N*1111
30 NEXT N
35 PRINT AT 9,0;"TARGET= 31"
40 IF A$(1)="Y" THEN GOTO 220
100 PRINT AT 10,0;"NUMBER?"
110 INPUT N
111 LET N=INT ABS N
112 IF NOT N OR N>M-1 THEN GOTO
110
113 PRINT AT 10,0;"       "
120 FOR A=1 TO 4
130 IF D(N,A)=0 THEN GOTO 145
140 NEXT A
145 PRINT AT N-1,A-1;"."
150 LET D(N,A)=1
160 LET R=R-N
164 PRINT AT 9,0;"TARGET= 31"
165 PRINT AT 10,0;"TOTAL=";31-R
166 IF R=0 THEN GOTO 340
167 IF R<0 THEN GOTO 350
170 FOR N=1 TO 4
180 IF D(M-1,N)=0 THEN GOTO 220
190 NEXT N
200 LET M=M-1
210 GOTO 170
220 LET G=R-M*INT (R/M)
230 IF R/M=INT (R/M) THEN LET G
=1+INT (RND*(M-1))
240 FOR N=1 TO 4
250 IF D(G,N)=0 THEN GOTO 300
260 NEXT N
270 LET G=1+INT (RND*(M-1))
280 GOTO 240
300 PRINT AT G-1,N-1;"."
310 LET R=R-G
315 PRINT AT 10,0;"TOTAL=";31-R
316 IF R=0 THEN GOTO 350
317 IF R<0 THEN GOTO 340
320 LET D(G,N)=1
330 GOTO 100
340 LET T=1
350 IF T=1 THEN PRINT AT 12,0;"
YOU WIN."
360 IF T=0 THEN PRINT AT 12,0;"
I WIN."
370 PRINT "AGAIN?"
380 INPUT A$
390 IF A$(1)="Y" THEN RUN
400 STOP
```





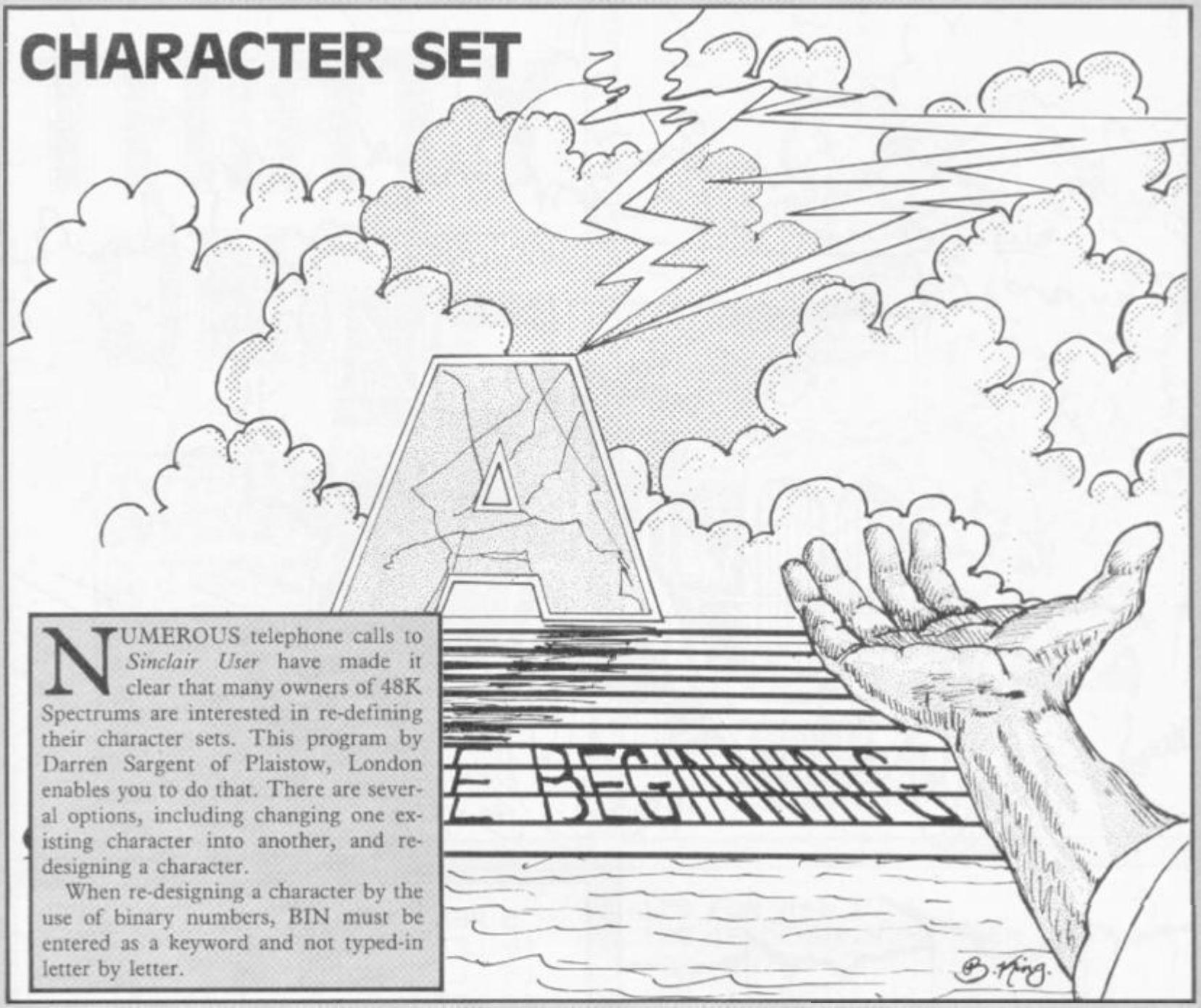
MAZE

AS YOU MOVE down the screen, steering with the usual cursor keys, a maze moves up towards you. How far can you move through it before your way is blocked or you crash into a wall?

Maze was written for the 1K ZX-81 by C Hopley of Liverpool.

```
  5 REM "MAZE"
 10 LET X=CODE "(a5)"
 15 LET S=NOT X
 20 LET Y=S
 25 LET D=CODE "COS "
 30 LET E=CODE ")"
 40 IF INKEY$="6" THEN GOSUB D-
E
 50 GOSUB D
 60 LET Y=Y+(INKEY$="8" AND Y<E
)-(INKEY$="5" AND Y>NOT X)
 80 GOTO D/X
190 LET S=S+CODE "(a1)"
191 PRINT AT CODE "=",NOT X;"(1
6*isP)"
192 GOSUB D-X
194 PRINT AT CODE "=",RND*E;"(i
sP)";AT CODE "(",RND*E;" ";AT CO
DE "(",RND*E;" "
199 SCROLL
200 PRINT AT X,Y;
205 IF PEEK (PEEK 16398+PEEK 16
399*VAL "256")=CODE "(isP)" THEN
 GOTO CODE ")="
210 PRINT AT X,Y;"(i*)";AT X,Y;
"*"
215 RETURN
220 PRINT "(i*)SCORE=";S-CODE "
(93)"
```

CHARACTER SET

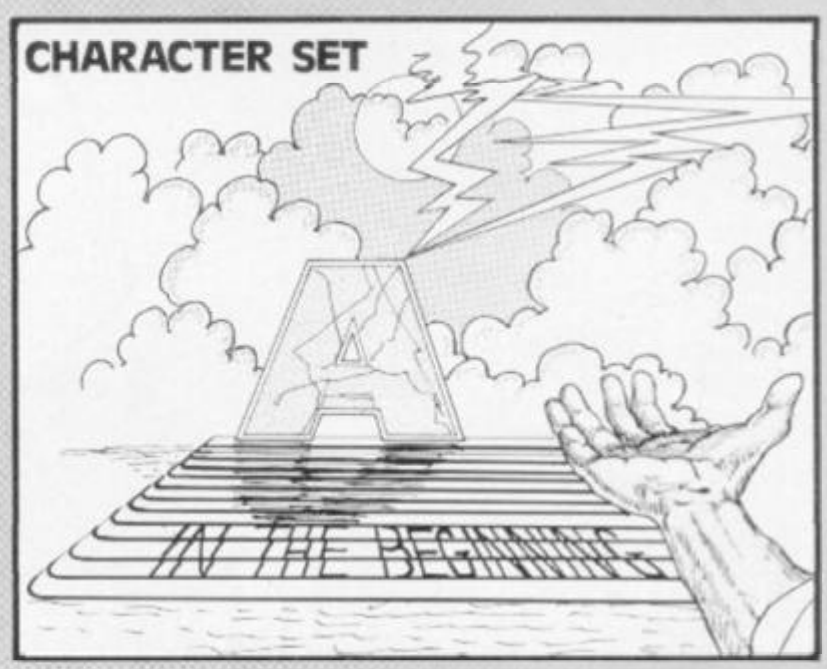


NUMEROUS telephone calls to *Sinclair User* have made it clear that many owners of 48K Spectrums are interested in re-defining their character sets. This program by Darren Sargent of Plaistow, London enables you to do that. There are several options, including changing one existing character into another, and re-designing a character.

When re-designing a character by the use of binary numbers, BIN must be entered as a keyword and not typed-in letter by letter.

```
 10 PRINT TAB 11;"CHARACTER"
 20 PRINT '''This program will
design the"'"character set of th
e SPECTRUM."'"Because of this,an
y characters"'"PRINTed will appe
ar as you "'"have re-designed th
em."
 30 PRINT "Press ENTER to conti
nue.."
 40 IF INKEY$<>CHR$ 13 THEN GO
TO 40
 50 CLS : PRINT ''TAB 13;"MENU
-";
 60 PRINT "1)Redesign a charact
er"'"2)Set a character to it's u
sual"'"Sinclair form"'"3)Change
a character into "'"another"'"4)
Go back to Sinclair charactersan
d exit from program"'"5)Set uP u
ser-defined chars."'"6)Print out
 charcter set"
 65 PRINT AT 19,0;"(Use option
5) initally)"
 70 IF INKEY$="" THEN GO TO 70
 75 LET a$=INKEY$
 80 BEEP .1,20
 90 IF a$>"6" OR a$<"1" THEN GO
TO 70
 95 BEEP .2,VAL a$*2
 96 CLS
 97 GO TO (VAL a$*100)
100 PRINT "Which character do y
ou wish to "'"redesign ?"
105 INPUT c$: IF c$<" " OR c$>"
@" THEN GO TO 105
107 LET x=8*(CODE c$-32)
110 CLS : PRINT AT 0,0;"Redesig
ning '";c$;"'": FOR c=0 TO 7
120 PRINT AT 2,0;"Enter data fo
r row ";c+1'"(You can use the fu
nction 'BIN')"
130 INPUT d: IF d>255 OR d<0 TH
```

```
EN GO TO 120
 140 POKE 31831+c+x,d: NEXT c: G
O TO 700
 200 PRINT AT 0,0;"Which charact
er do you wish to"'"return to no
rmality?": INPUT c$: IF c$>"@" O
R c$<" " THEN GO TO 200
 205 LET x=8*(CODE c$-32)
 210 PRINT AT 11,16;c$
 220 FOR c=0 TO 7: POKE 31831+c+
x,PEEK (15616+c+x): NEXT c: GO T
O 700
 300 PRINT "Which character do y
ou wish to "'"change?";
 310 INPUT c$: IF c$<" " OR c$>"
@" THEN GO TO 310
 320 PRINT ''"What do you wish t
o change '";c$;"' into?"
 330 INPUT n$: IF n$>"@" OR n$<"
 " THEN GO TO 330
 340 LET x=8*(CODE c$-32): LET y
=8*(CODE n$-32)
 350 FOR c=0 TO 7: POKE 31831+c+
x,PEEK (15616+c+y): NEXT c: GO T
O 700
 400 POKE 23606,0: POKE 23607,60
: PRINT TAB 12; FLASH 1;"Goodbye
": STOP
 500 CLEAR 31574: PRINT AT 0,0;
FLASH 1;"Nothing's Wrong!!"
 510 FOR c=0 TO 767: POKE 31831+
c,PEEK (15616+c): NEXT c: LET a=
31831-256: LET b=INT (a/256): LE
T c=a-b*256: POKE 23606,c: POKE
23607,b: GO TO 700
 600 FOR c=32 TO 255: PRINT CHR$
 c;: NEXT c: GO TO 700
 700 PRINT AT 1,0;£1;"Press any
key to return to menu": PAUSE 0:
 GO TO 50
```

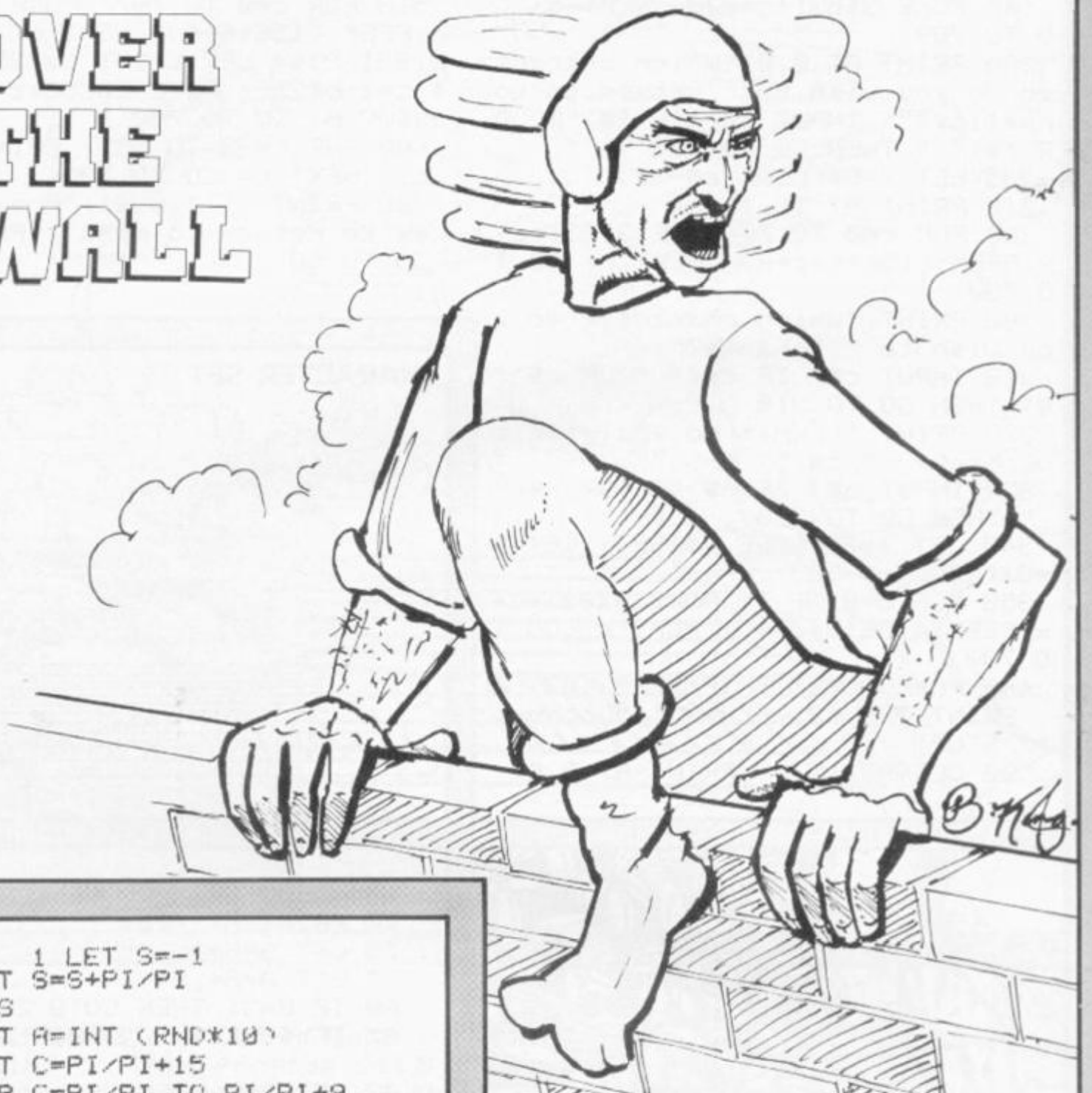


CLEAR THE hurdles in front of you by pressing "J" to jump. Remember that jumping is tiring so that the longer and more frequent your jumps, the smaller your chance of clearing the next hurdle. Your score will be given when you fail to jump a hurdle. For the 16K ZX-81 by Bruce Harkins of Stewarton, Ayrshire.

```
15 LET T=0
20 CLS
21 LET Z=0
25 LET A=9
28 LET B=0
30 FOR N=0 TO 31
40 PRINT AT 10,N;"(9f)"
50 NEXT N
```

```
 60 GOSUB 300
 70 PRINT AT A,B;" "
 75 LET B=B+1
 77 LET A=A+.5
 80 IF B=31 THEN GOTO 20
 85 IF INKEY$="J" THEN GOSUB 40
0
 87 IF A<=0 THEN LET A=0
 88 IF A>=9 THEN LET A=9
 90 PRINT AT A,B;"(i>)"
 95 PRINT AT A,B+1;
100 IF PEEK (PEEK 16398+PEEK 16
399*256)=128 THEN GOTO 200
105 LET T=T+1
110 GOTO 70
200 PRINT T
210 PAUSE 50
220 GOTO 1
300 FOR D=1 TO 3
305 LET F=INT (RND*27)+5
310 PRINT AT 9,F;"(isP)"
320 NEXT D
330 RETURN
410 LET Z=Z+1
420 IF Z>=10 THEN RETURN
430 LET A=A-1
440 RETURN
```

OVER THE WALL



```
ψψ^^~^    1 LET S=-1
   5 LET S=S+PI/PI
   6 CLS
  10 LET A=INT (RND*10)
  20 LET C=PI/PI+15
  30 FOR G=PI/PI TO PI/PI+9
  40 PRINT AT G+10,15;"(i-)"
  50 NEXT G
  51 PRINT AT 5,0;"(isP:30*96:is
P)"
  52 PRINT AT 20,A;"(isP)"
  53 PRINT AT 20,C;"(9a)";AT 20,
C;" "
  54 IF INKEY$="0" THEN GOTO 80
  60 LET C=C+(INKEY$="8" AND C<3
0)-(INKEY$="5" AND C>16)
  70 GOTO 53
  80 FOR D=C TO C-15 STEP -1
  90 PRINT AT 6,D;"(9a:sP)"
 100 NEXT D
 110 PRINT AT 6,D-2;"      "
 120 PRINT AT 20,D;"(9a)"
 120~PRINT AT 20,D;"(9a)"
 130 IF D=A THEN GOTO 5
 140 PRINT S
```

YOU ARE the inverse square on the right of the wall and your friend is the inverse square on the left. Throw her the paint brush by pressing "ø". The brush will then go up in the air, slide along the roof for 15 squares, and fall again. By moving yourself left and right with keys "5" and "8", see how many times you can throw it without missing her.

Over the Wall was written for the 1K ZX-81 by Neil Benson of Wildwood, Stafford.

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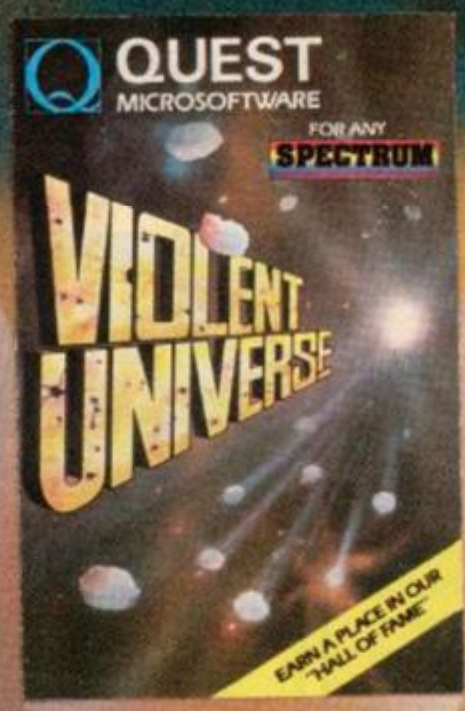

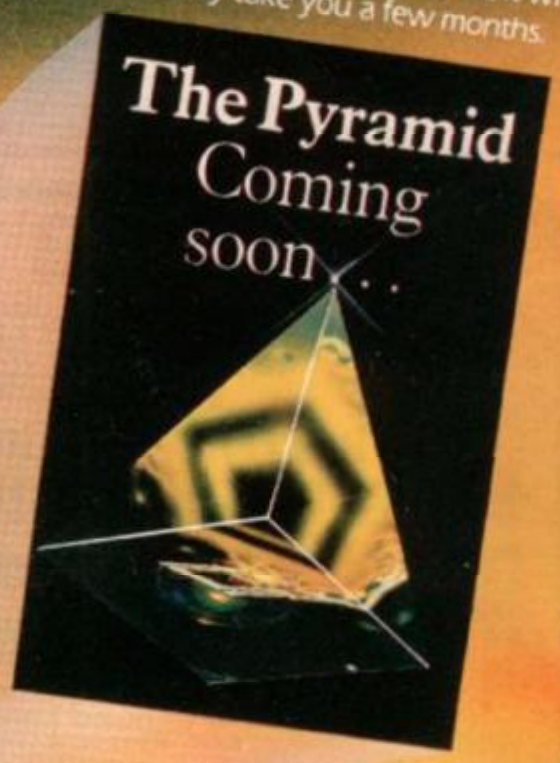

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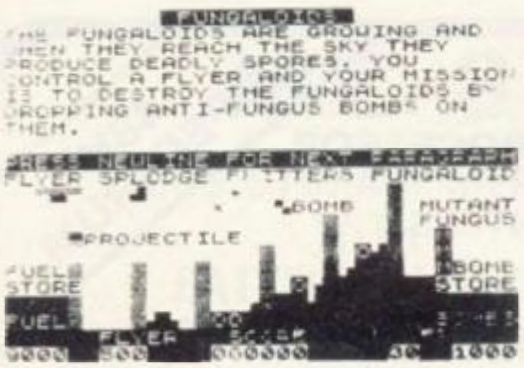

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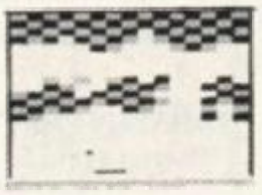

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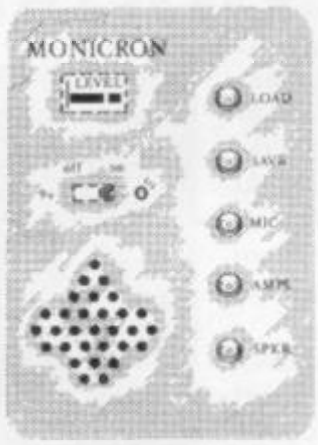

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Stephen Sowerby is a member of the Olympic pentathlon squad. Claudia Cooke discovers how he makes time for training

Leading athlete's quest for gold is boosted by ZX-81

INTERNATIONAL athlete Stephen Sowerby swears by his ZX-81. Without it, he says, finding the time to train is much more difficult. At 28, Stephen hopes to make his Olympic debut as one of the four-man modern pentathlon squad in the 1984 Games in Los Angeles.

On top of that, he runs two businesses near his home in Yorkshire and spends what precious spare time he has on his hobbies of photography and wine and beer making. He says:

"I'm impressed with the little beast — the ZX-81. I bought it last December with the idea of upgrading it as soon as I had mastered it but I don't see any need now. It does everything I want it to do".

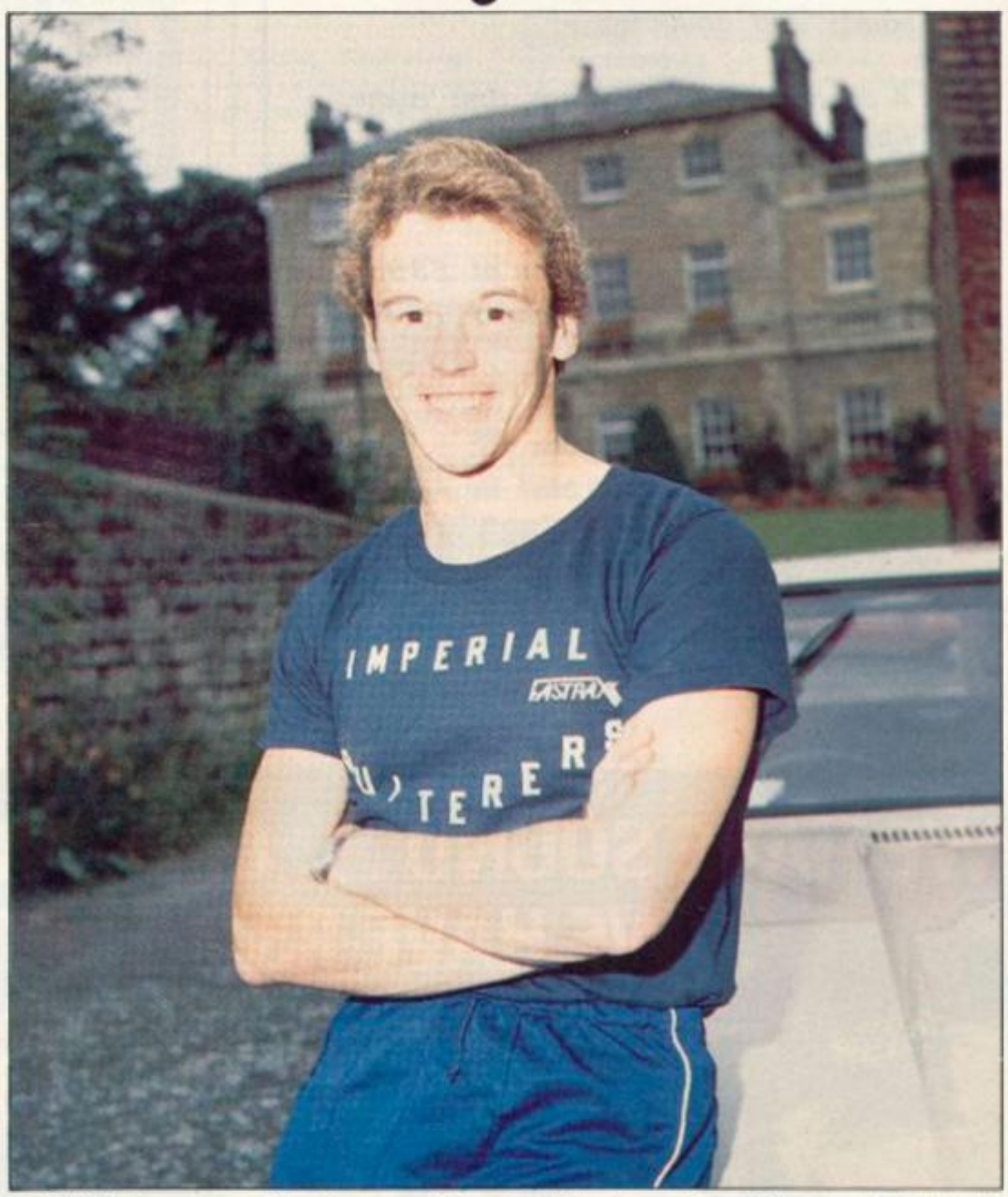
Before buying his computer, Sowerby had had no contact with anything more complicated than a pocket calculator but he decided that anything which could speed his office workload would be invaluable.

"First, I waded through the book and made it to work. Then I wrote my first program, a simple one for VAT checking which has been fantastic. I found that it was really easy if you used common sense. Of course, there were headaches along the way but I sat down and scratched my head and it all came out right.

"I am pleased to say that I have never bought a commercial program. I have written 10 of my own; the longest is for helping me to do the accounts. The amount of time it saves is incredible. I buy the computer magazines and use some of the programs in them. Apart from being fun they can be really helpful, too, because sometimes you discover you have been using five lines where someone else has discovered a way to say the same thing in only one line".

Running his business, as well as fitting in his sports activities, means that Sowerby is highly-motivated to do everything in as short a time as possible and the computer has helped.

"If I have all my work done by a reasonable time in the afternoon I can leave and fit in more training. So the computer is helping me in my sport, too". Modern pentathlon is a gruelling combination of sports, the aim being to find the best all-rounders. It embraces swimming, running, fencing, shooting and show jumping.



"Swimming was always my main sport at school. I won at county level and was in the national top 10 when I was 17. Then I went to Carnegie College, Leeds to train as a physical education teacher for three years and I stopped competitive swimming.

"My fist job was as a teacher of PE, swimming and outdoor pursuits at Daniel Stewarts and Melville College, Edinburgh, where David Wilkie went to school. I thoroughly enjoyed it but after a year I had the chance to swim competitively again with my old club in Leeds and so I left teaching to give myself more time.

"I was trying to be selected for the Commonwealth Games and that meant four or five hours in the water every day. Then I entered the national biathlon — swimming and running. I had entered it and won while I was still at college and that time I won it again".

Sowerby is modest about that achievement, saying that although he was always the best runner at school, he assumed that was simply because he was fit from all the swimming.

The result of his success in the biathlon was that the well-known pentathlete, Jim Fox, suggested he should try

modern pentathlon. He had never fenced before, never used a gun, and scarcely ridden a horse but after only four weeks' training, he entered his first pentathlon in Cambridge and finished second, despite the presence of seven international modern pentathletes.

Since then he has not looked back. He has risen to international status and travels the world to compete in events as far afield as the United States—three trips already—and several countries in the Eastern bloc.

"I love the travelling and there are so many places I know I would never have seen had it not been for the competitions there. We were in Poland at the start of the crisis and I learned a good deal from that.

"They absolutely revere their sportsmen. There were food shortages and queues everywhere but we had meat at every meal and the autograph hunters were all round us".

Sowerby is the only member of the four-strong Olympic squad who does not train full-time but he sees that as no bad thing.

"I have all the practice I need and in a way I think my job helps, because it takes my mind off things. If you are just training all the time you think only about your sport and it doesn't necessarily do you any good. You just become bored waiting for the next training session.

"I am glad I tried the modern pentathlon because I am so much happier now. You have to be good at all five events but if you don't do so well in one aspect, it's not the end of the world. When I was swimming, one race might make or break me.

"Now I know I am the worst fencer in the squad but I am training hard and my running and swimming are strong enough to compensate for it".

The businesses which Sowerby runs stem from the enterprise of his parents, Dennis and Elsie, who formed their joinery company at Knaresborough 30 years ago. As the business flourished, so more and more customers needed glass, so he formed Knaresborough Glass and now runs both companies with the help of his father.

Set in a small yard off the main street in the sleepy Yorkshire market town, with offices in a building known as the hen hut, it is a far cry from the glamour of the international sports circuit but Sowerby, who last year married a fellow member of his swimming club, is happy to return to his hen hut and sit crouched over his computer.

Since buying the ZX-81 he has also bought an Olivetti printer driven by a Memopak I/F which he keeps hidden under the dK'tronics keyboard.

"The printer has been a marvellous help, too. I have written a word processor program and I use it for all my letters, for final demands, invoices, everything really. I begin to wonder what I did without it".

Sowerby also sees potential for computers in the world of sport. Already they are used widely for results, as well as for much of the administrative work, but he cites a need for them in sports such as fencing. Each fencer's sword has a button on the end which lights at certain points of contact with the opponent and is controlled by a box mechanism. "That box mechanism often fails and as there is only one company making fencing equipment, there is not much we can do but a computer to operate that mechanism could prove far more reliable and I am sure someone could make money producing it".

Sowerby feels the project is a little ambitious for him, although he maintains that if you want to do something, you can usually do it even when, as in his case, it seems as if there will never be the time.

"I do a great deal with my time but I enjoy it all, otherwise I wouldn't do it. I will go on as a pentathlete until I stop enjoying the training. When it becomes a real chore and you don't want to do it, that's the time to stop.

"Many people seem to think I must be sacrificing a great deal for sport but I don't see it as a sacrifice, because I enjoy it.

"The only things I miss are smoking 40 cigarettes a day and probably being overweight by the age of 18. So where's the sacrifice?"

Financially, Sowerby has to be self-supporting in his sport and that can mean sacrificing some expense — the Spectrum, for example, for which he sees no need in his office but on which he loves playing games for its colour and its extra graphics.

Any purchase not essential to him stays in the shop but that could be why both his business and his sporting career are proving so successful.

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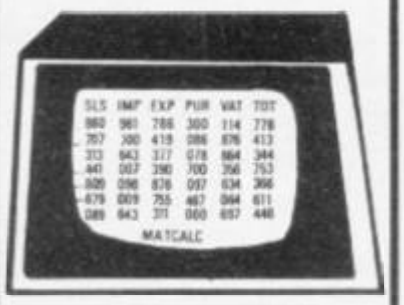

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Programmers have long looked at ways of playing chess on computers. Chris Whittington points out some of the problems

BROADLY, there are two main schools of thought concerning the problem of programming computers to play a game such as chess. The first and most dominant suggests that the way forward is to use the number-crunching power and speed of modern computers to plough their way through as many possible paths arising from a particular position, apply some simple evaluation to the positions arising in the path, and by that method arrive at the best move. That approach has become known as the brute force method.

The second school of thought points to the highly-successful techniques already applied by human players to the problem and suggests that the best approach would be to teach the computer to think like the best human players. We shall call this the knowledge method.

Faced with the problem of producing an effective chess-playing program for a home computer such as the Spectrum, we can probably discard the knowledge method, if only because we still have no real idea how it is that human grand masters decide on their next best move. Indeed, what do we mean by best move? There is no real choice at present other than to use the brute-force method for solving the problem.

Before we begin to explore a possible solution it would be best to examine in some detail the nature of the problem. Chess is a two-player game. Whatever is good for one side is bad for the other and vice-versa; such games are known as 'zero-sum games'. That will allow us to make statements such as this move gives White a score of +250 and thus gives Black a score of −250.

The game is played on a board of fixed size with a fixed number of pieces; therefore we should be able to represent the board and pieces in some way in the computer memory.

The laws of chess define how the pieces move, whether any position is illegal — for example, leaving one's king in check — and how to decide on wins, losses and draws. In principle, therefore, we should be able to define and encode all the possible ways of moving a chess piece, detecting checks and so on.

Unfortunately, from our point of view, a number of different chess pieces each move in a different manner and some of them move in some different manner in special circumstances — for example castling, *en passent*.

I suspect that the apparently daunting task of defining all those possible moves for each of the pieces and encoding them into assembly language deters

many a budding chess programmer from beginning the task. Some of the early chess programs, and even some one can still buy, avoided the problem by not implementing the difficult portions, with the result that their program just never did castle or capture *en passent*.

The problem is not as daunting as it seems; one can work out routines to do the task and there are published algorithms, and even listings, which can remove some of the tedium.

Since we have to decide on a best move we will need some way to evaluate, or attach a number to, any move. The conventional wisdom is to keep that position evaluator as simple as possible, usually measuring the balance of material and a few positional factors. It will be of interest to note that the positional evaluation will be the only part of the program where chess knowledge and skill, as apart from a knowledge of the rules of the game, will be required.

There has been much controversy between strong chess players and computer programmers as to whether poor chess players can produce good chess programs. Certainly the best programs usually have been prepared with the help of strong players and my feeling is that substantial chess knowledge is of most use after the program has been completed and is being play-tested to tweak the program to its optimal performance by adjusting the evaluation function.

Then we have the problem of how to plough our way through all the moves to arrive at our brute-force solution. In chess programmers' parlance that is known as the 'exponential explosion problem' and it goes something like this:

On the Spectrum we can evaluate a position in, say, 25 milliseconds. In any one chess position there will be around 30 legal moves to consider. Thus to look one half-move deep we need to evaluate some 30 positions to arrive at the best move. That takes 30 times 25 milliseconds, or 0.75 seconds.

To search two-ply deep we need to look at 30 positions and all the 30 positions arising from each of those — 30 times 30 positions in all will take 900 times 25 milliseconds or 18 seconds.

By that reckoning to search three-ply

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takes nine minutes, four-ply takes 4.5 hours, five-ply takes almost a week, and so on.

To achieve good results against strong players, a program will need to search between eight- to 10-ply moves deep. According to the previous calculations an eight-ply search would take 400 years to complete. Such a game, starting in pre-history might now be nearing completion.

If we are to get anywhere using brute-force methods we must concentrate on refining our search through the tree of moves to reduce or eliminate the blow-up effect. As an aside, a game such as draughts, which has far fewer possible moves arising from any one position, does not generate such severe problems and thus machine-coded draughts programs are more likely to defeat strong players than similarly-encoded chess programs.

Fortunately there are several methods to refine the tree search. The programs available on the Spectrum and ZX-81 have reduced the multiplication factor for each ply from about 30 times to around four to eight times.

Adopting a top-down approach to the problem, we can formulate our first statement of the approach we shall be taking.

We shall use the method of brute force with refinements, evaluating each node — position — in the tree of moves according to a simple and fast evaluation function, biased heavily by material factors.

The program will need to be as fast as possible and must therefore be encoded into machine code. Basic would be far too slow.

> 'We must concentrate on refining our search through the tree of moves'

We shall require adequate tools for this task. As a minimum we shall need a powerful editor to work on the assembly language files. Since those files may be as large as 40K bytes — 100K bytes when properly documented — we shall need a disc-based system to hold them.

We shall need an assembler program to turn the assembly language files into machine code and a monitor program to help remove bugs. Only after the program is running without bugs shall we consider putting it on to our small home computer system.

Our next task will be to break down the problem further and define particular areas of the program to which we must attend.

Main modules — tree-search algorithm; move generator; is king in check? detector; position evaluator.

Database — how to represent the chessboard; how to store the moves and positions as we move up and down the tree; tables containing knowledge about the position which can be used by the position evaluator.

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The machine plays chess? Author, Alex Bell. Publisher, Pergammon.

Think like a grand master. Author, Alexander Kotov. Publisher, Batsford.

Chris Whittington, the author of this article as well as eight available chess programs, is now working on yet another chess program and would be pleased to receive wisdom and new ideas from readers. He can be contacted either through *Sinclair User* or CP Software.

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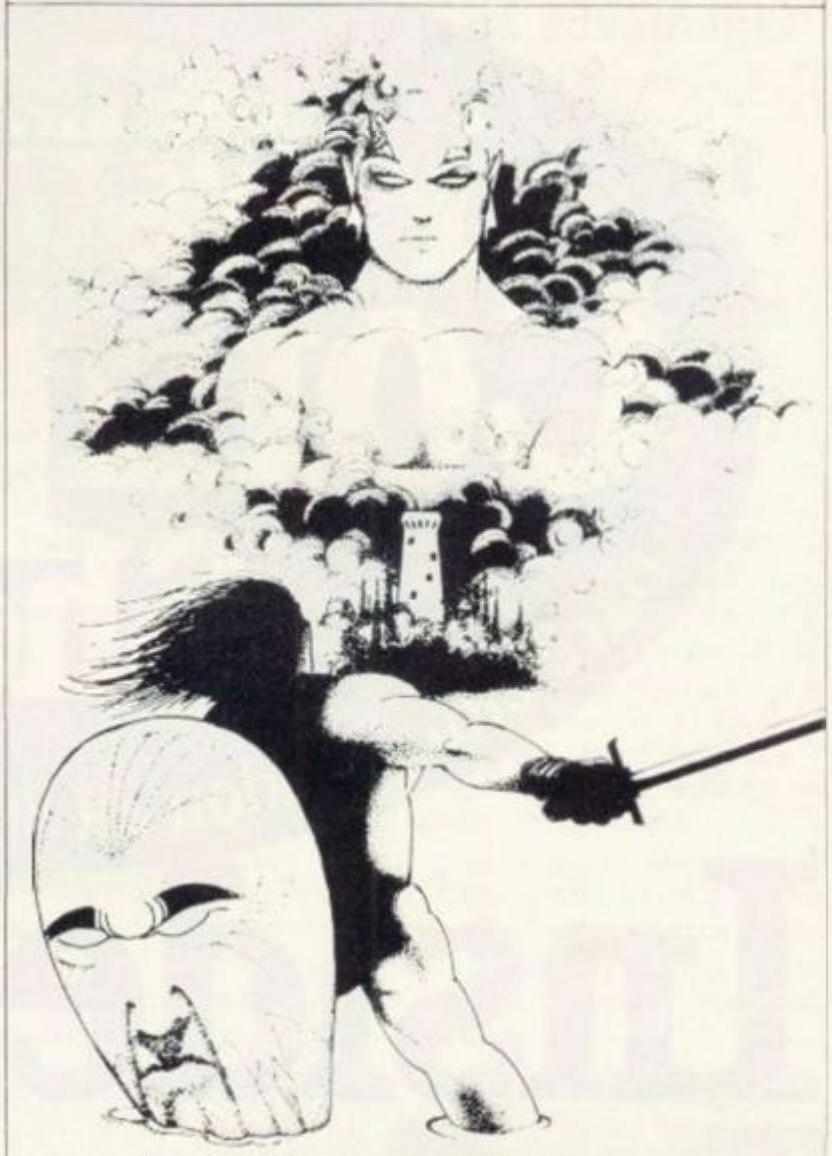

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In the first of a new series, John Gilbert introduces an alternative to Basic. Later we will be showing how to make use of its advantages

Coming Forth could be a winner in program stakes

FORTH is a new language in microcomputer circles but it has been around for several decades. It was designed originally to control a radio telescope. Since then it has been used in control applications and is seen as an ideal language for the programming of robots and industrial machinery.

This series will explain how Forth is structured, how you can program using it, and how you can change the language to suit your needs.

Forth is now seen as an important language because it is faster in execution than Basic and it is one which can be learned very quickly by a newcomer to computing.

Some people may find it more difficult to use than Basic because it does not use line numbers and the programs written using it are in the form of several routines and not one mass structure. In that way you can have several programs in the computer at once.

If you are to follow my arguments you will need to forget about the way in which you program in Basic. Forth is completely different and, as you will soon see, you cannot be as liberal in its use as you were with Basic.

One of the reasons for using Forth in the control of machinery is its speed compared to other high-level languages. For instance, Forth is more than 10 times faster than Basic and a game of Space Invaders written using it would move almost as fast as if written in machine code. The reason is that Forth is closer to machine code than to other high-level languages.

When Forth was introduced there was no standard for the language, so an organisation called the Forth Interest Group was formed. Since then a new, second standard has been introduced which is called Forth-79. That does not differ much from Fig-Forth but Forth packages are now divided into the two standards.

Most of the packages available for the Spectrum and ZX-81 use Fig-Forth, although some provide only a subset of the language. For instance, Forth programs are divided into screenfuls of memory. The Artic Forth package allows only one screen in memory at a time, whereas other packages, such as that from Abersoft, allow several screens.

There are several packages from which to choose, so each will be covered in turn and finally a standard will be determined for the series.

Sinclair Research has just adopted Artic Forth for the ZX-81 and 48K Spectrum, which use the Fig-Forth standard. The package includes the cassette containing the Forth language and two booklets. The thicker booklet explains the language and the slim one shows how the program editor should be used. The function of the editor will be described in more detail next month.

The packaging of the Artic cassette is colourful but the version of the language has some limitations. Forth programs are stored by the screenful in memory. Each screen is addressed by a number, so if you wanted to recall a program which was stored on screen 1 you would use that index number to access it as the current screen.

In that way you can store several programs, called words, in the machine at any time. The current screen is the one on which you are writing at the moment or the one which is being used by the computer.

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The number of screens which can be stored in the computer at once is, of course, governed by the memory available. It is possible to store several screens of program in both the ZX-81 and Spectrum but Artic Forth will store only one. If you want to use screens other than the current one you have to load them from cassette, one at a time. That is irritating because such a process is not necessary with the memory capacity available.

The other difficulty with the package is that the documentation — the two manuals — does not provide a sufficient introduction for the beginner. The difference in approach between Sinclair Basic and Forth is not made apparent enough and the transition between the two languages is not easy using the manuals.

After all, the user will have a knowledge of Basic and an introduction to a second language will be much more difficult than an introduction to computers through Basic. It often means becoming used to new concepts and not just new language statements.

The second package is slightly better and contains a full version of Forth. It is from CP Software, called Spectrum Forth. Owners of 16K Spectrums will be pleased, as CP does a version of the language for that machine. Spectrum Forth also includes a program written in Forth so that the user can run an example before delving into the depths of the language.

The final version is from Abersoft. It is also for the Spectrum but will run only in 48K. It has a bigger dictionary capacity for programs than the 16K version from CP.

It is a complete version of the language with added colour, attribute and graphics instructions which can be used to zap space invaders around the screen, if you are that way inclined. It is also possible to define your own characters just as you can in Spectrum Basic.

Unfortunately the product has a manual which is concise but not easy to understand. It is a flimsy booklet which has not been written to inspire confidence for the first-time user.

Of the three packages available, the one to be used in this series will be that from Abersoft. It is the only Spectrum package which has been endorsed by the Forth Interest Group. It is a complete Fig-Forth package which allows several screens of program in memory at the same time.

> 'Forth is closer to machine code and more than 10 times faster than Basic. A game of Space Invaders written using it would move almost as if it is written in machine code'

The Abersoft manual is not good but there are several books on the market which explain Forth and its application in terms the beginner will understand.

One good book is *The Complete Forth,* by Alan Winfield. It is published by Sigma Technical Press and gives an introduction to Forth concepts. The book uses Forth-79 but there is much information which will be useful to the Fig-Forth user. Next month I will explain the structures which are used in Forth. You will see that the language does not use line numbers but this makes it easier and not more difficult to use.

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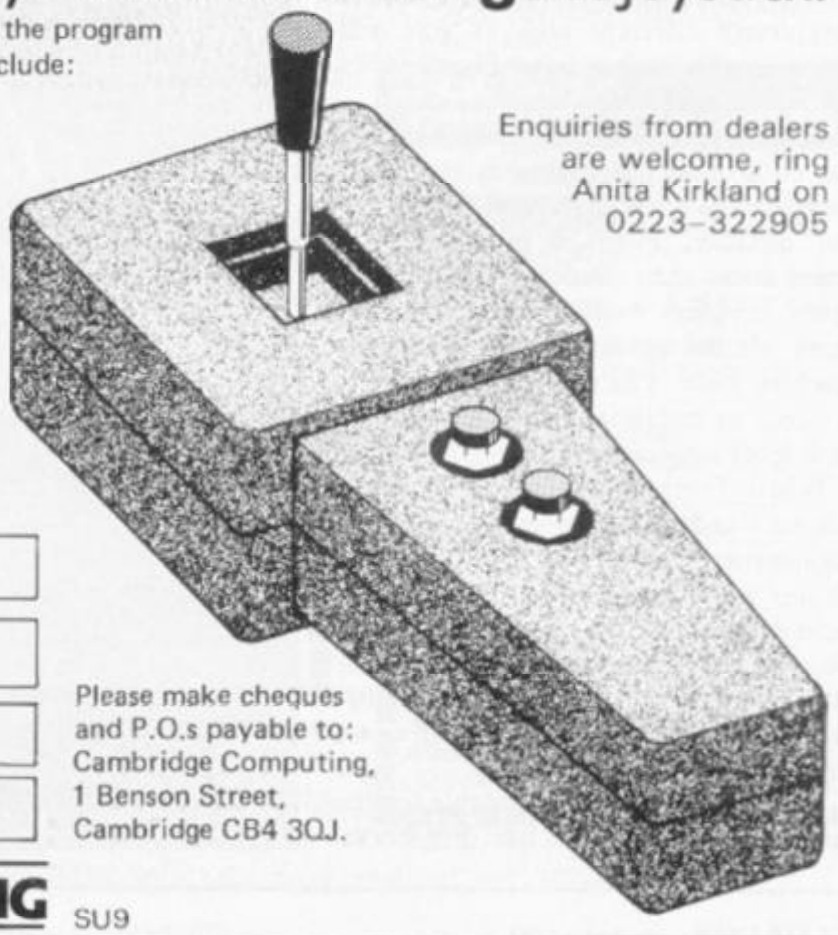

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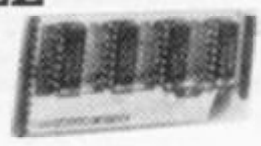

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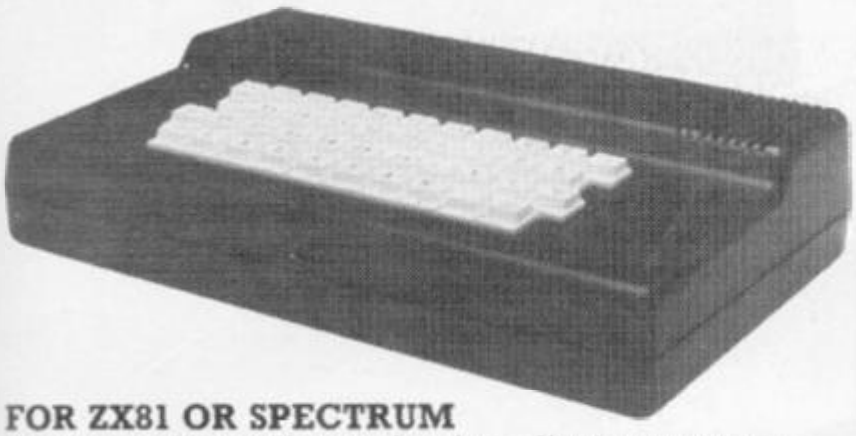

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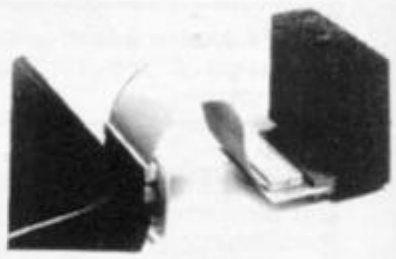

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You can utilise the menu for changing colour (Border, Paper, Ink). Drawing circles, arcs, boxes, lines. You are also able to fill any object with any colour, and insert text onto the screen at any chosen place. Of course you can also draw freehand.

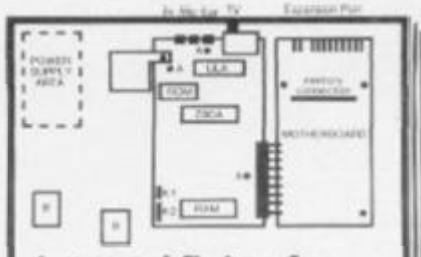
There is a feature to retain the screens and animate. On the 48K Spectrum you can retain 5 screens.

You can also use the machine code on it's own in your own programs, for selecting out of a menu etc. The software provided will return with the X,Y, cords for it's position on the screen.

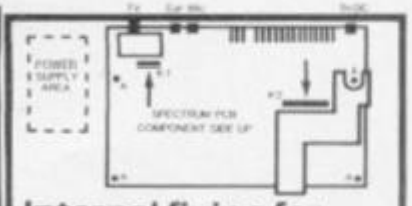
The light pen is supplied with a control interface in order to adjust the sensitivity/pen alignment.

This simply plugs into the ear socket on your spectrum.

Should you require further details please send a S.A.E.



Internal fixing for ZX 81 keyboard case.



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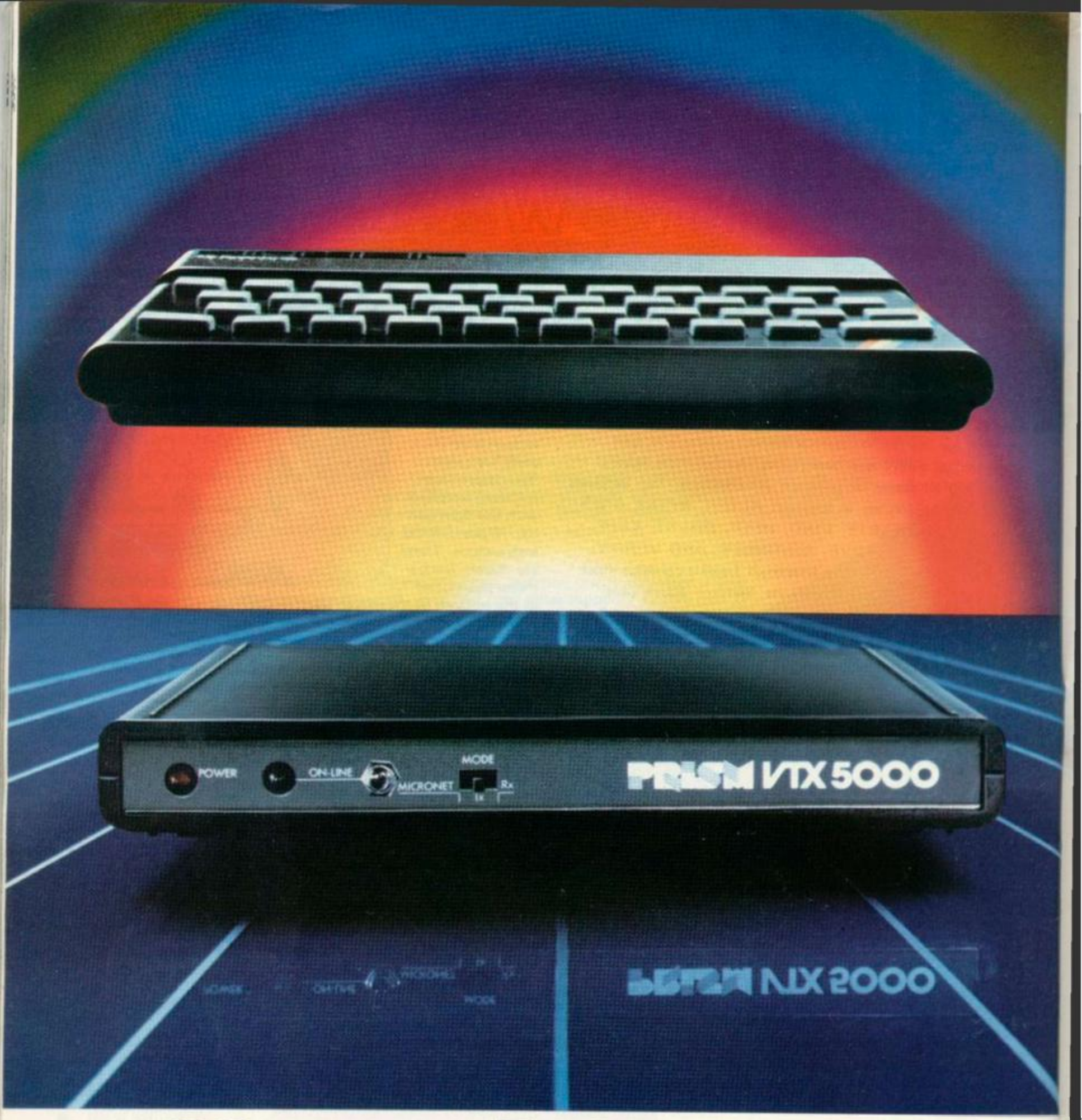

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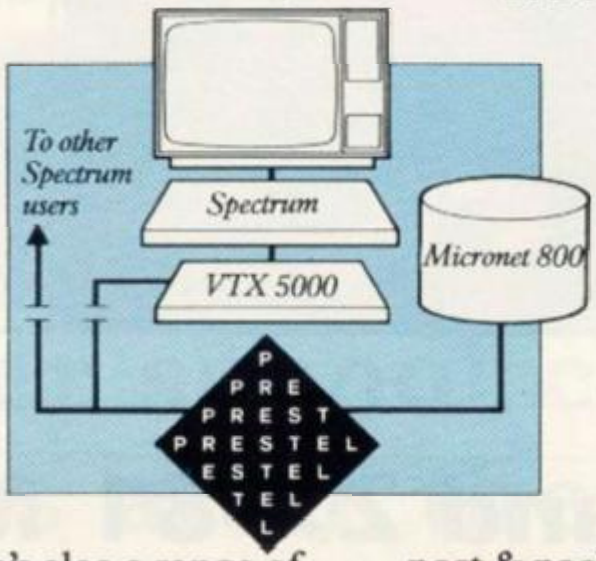

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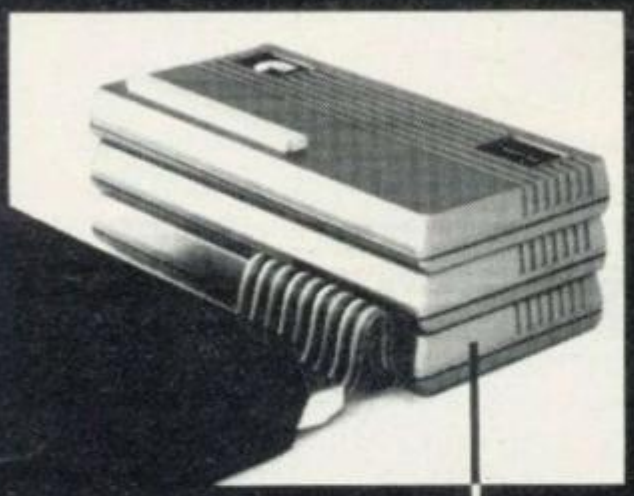

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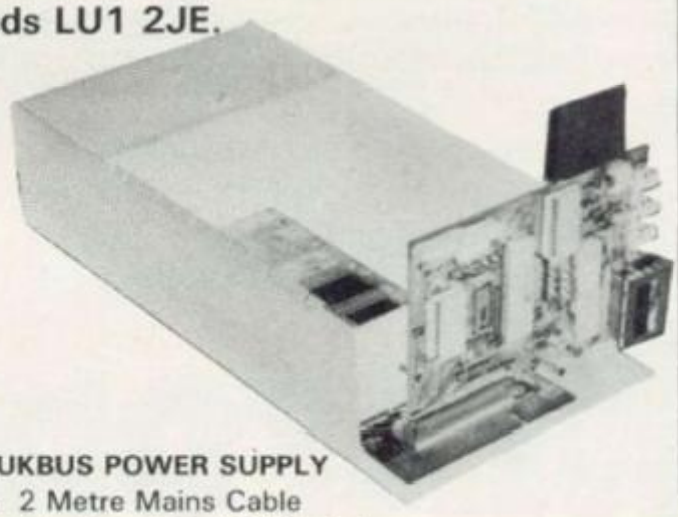

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Former school chum now looks after the money

In the management changes at Sinclair Research last year, Bill Matthews became financial director. He talks to Claudia Cooke

BILL MATTHEWS sits in his office and smiles at the recollection of his old school chum, Sir Clive Sinclair, tinkering with radios while the other boys listened to them.

"He was innovative even at that age, you know. He was always tinkering with something and he made his first matchbox-sized radio while we were still at school.

"We lived very near each other in Guildford and I remember going to his house for enthusiastic demonstrations of his latest plans. I think he was very much an individual character and did not fit into the standard schoolboy image at all".

A great deal has happened to both men since those early days at St George's School, Weybridge, Surrey. Now, once again, they are together, Bill Matthews having joined Sinclair Research as finance director last September.

"I was working in Toronto last year and Clive had to go there for a Mensa conference. We had lunch and he asked me if I was interested in this job. I thought what the hell, why not? Here I am, thoroughly enjoying it".

The two men, in fact, worked together previously, but in the very early days of Sinclair Radionics. "I think I kept his cash book or something when he was busy packing-up and selling little bits by mail order. It seems a long time ago".

Matthews, now 43 and married with four children, went straight from school to read economics and business administration at Sheffield University. He followed that with training at a firm of accountants in London, qualifying as a chartered accountant in 1963.

The first five years of his career were spent in public accounting in Turkey and Italy. "It was great to be able to travel and, having been released from all that studying, I did a reasonable amount of work but certainly nothing you could call strenuous".

Then followed marriage and the offer of a job with ICI as a group accountant. He spent four years there and still considers it one of the best-run companies for which he has worked.

He moved on to become financial controller for Sony U.K. for two years and was involved in setting-up the company's successful television factory in Wales. Emigration to Canada was the next step, working for management consultants Price Waterhouse. His most recent job, in Houston, Texas, was as executive vice-president of a company with clients from the oil and gas industries.

> 'He asked me if I was interested in this job. I thought what the hell, why not?'

continued on page 104

continued from page 103

A varied career but one which has always involved him in the use of computers, particularly for management information. The finance department at Sinclair Research is now in the process of computerising its system with an ICL 25. Matthews expects it to be of considerable help in financial reporting and control.

One of his first tasks at Sinclair was to place 10 percent of the company shares with institutional investors, an offer which was well-subscribed. He says:

"We see ourselves getting a Stock Exchange quotation in two years. It is still our intention to keep the company small in terms of the number of people employed; that concept has not disappeared.

"Sales have grown substantially and we have reached a size where we could issue shares and get a public quotation. It will be our coming of age, if you like".

Matthews sees one of his tasks as ensuring that Sinclair has sufficient resources to continue to grow rapidly and

> 'We have to be careful because the life expectancy of our product is fairly short'

ensuring that those resources are generated from within the company — from its profits. No easy task, he admits.

"Coming from a financial background, you find all companies have a great deal in common. The exceptional thing here is the sheer speed with which we are growing and the dynamism of our research activities.

"It can be a problem to find the resources to cover all that development. It creates its own problems and puts exceptional pressure on everyone who works here but it also creates a much more optimistic attitude among the staff. We tend to pay better than the normal market rates to get good people and it is a marvellous team".

Matthews says the company philosophy will always be to design products which are inexpensive and produced in large volume, thus making them widely-available.

"I think the Sinclair computers are marvellous little machines. We are just seeing the beginning of a revolution in the use of computers. The first stage was to make them so inexpensive that anyone could use them and Clive has certainly done that.

"We have to be careful because the life expectancy of our product is fairly short. You can be fairly sure other firms will catch-up rapidly. We have to make the best use of that technical lead and exploit it fully, to the best possible advantage. We cannot afford to sit still. In three years I do not suppose the ZX-81 will be marketed. We are not making pyjamas for Marks and Spencer after all; that kind of thing you can probably go on selling for about 200 years.

"We must have a stream of new and innovative products all the time and we must remain inventive".

Listening to those exacting standards is tiring but they are the standards which have taken Sinclair to the top so quickly and Matthews has absorbed them with equal speed. Approximately half the staff of Sinclair Research is involved in research and development and Matthews intends to concentrate substantial resources for its continuation, buying new premises and rationalising existing ones.

With Sinclair products tending to be market firsts, Matthews admits there is often a tendency to under-estimate the product. "When sales are restricted they are restricted by the ability to produce rather than lack of demand for the product but one has to be cautious to a certain extent," he says.

"You are making a commitment to the subcontractor, so you have to be careful not to over-estimate the demand. Then the subcontractor has to buy components and perhaps hire people. So you have to be as realistic as you possibly can.

"Producing new concepts means a greater risk element and greater flexibility in financial control. You have to keep re-assessing the situation in financial terms and try to predict what will happen".

Because the Sinclair market is largely domestic it is by nature more volatile than selling to big industry. This is another factor Matthews has to take into consideration. With all that on his mind, Matthews, who displays a Casio calculator on his desk, has not yet had much free time to experiment with the Sinclair products.

His eldest 15-year-old son has compensated for that. He has two Spectrums at home and, his father says, spends most of his time sitting solidly in front of them, lost to the world.

He has has two sisters, aged 12 and 13, and a five-year-old brother, but none is yet showing the same enthusiasm.

Matthews likes to keep fit in his spare time and when I visited him was keenly awaiting the Sinclair half-marathon due in Cambridge on July 17. No newcomer to running, he participated in last year's Boston marathon. Nevertheless he was taking the Cambridge event seriously. So, no doubt, was one of his fellow runners, Sir Clive Sinclair. Their speed, it seems, is not confined to work, nor their competitive spirit.

Matthews is reluctant to predict how long he will stay with Sinclair but says: "The chances are it will be a long time. I am really enjoying it so far and with the effects of recession hitting so many companies, it is fine to work for one as successful as this.

"We have built a very big turnover and we have the financial resources to expand into the future. That all gives the company a great deal of strength".

As part of the Sinclair management

BILL MATTHEWS
'Sinclair computers are marvellous little machines'

team, Matthews attends the monthly meetings of the board, together with Sir Clive, Nigel Searle the production director, and two research directors.

At the moment the board doubles as a management committee which has enabled Matthews to look at every aspect of the company within a short space of time. He likes what he has seen and is full of praise for everyone, from the genius of Sir Clive through the dedication of the rest of the staff down to the excellent quality of the company canteen.

In short, he appears to have been converted and he speaks as if he has been with the company for years. St George's, Weybridge should be proud.

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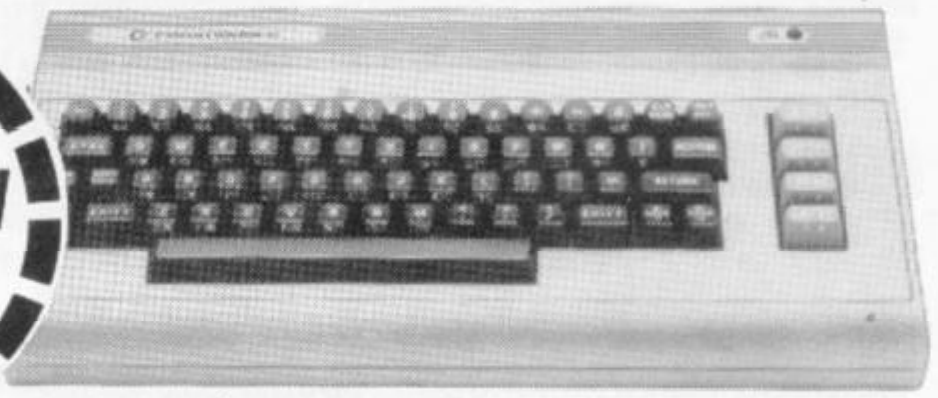

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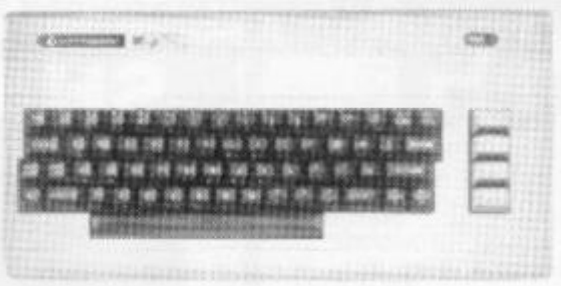

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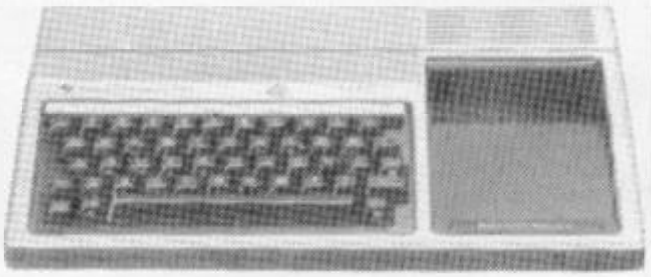

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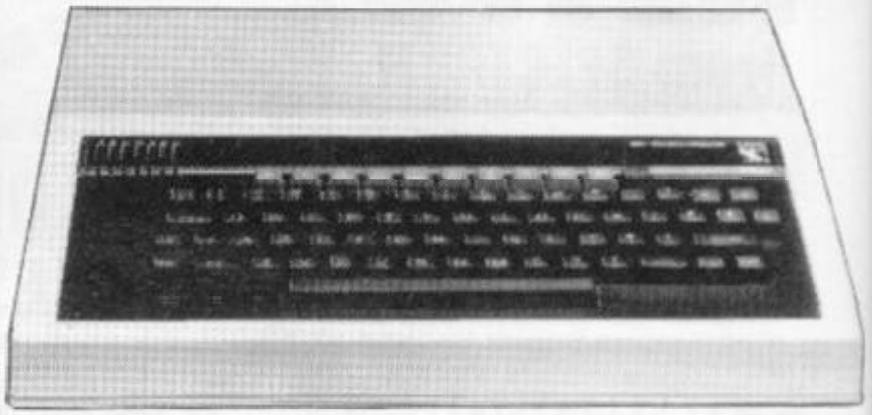

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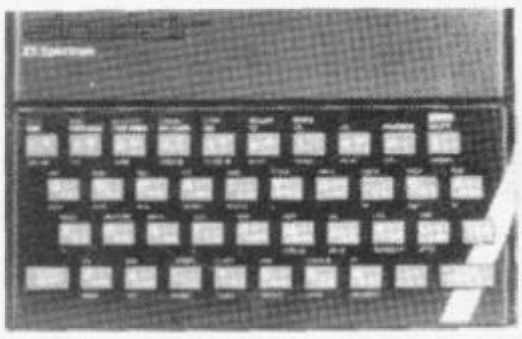

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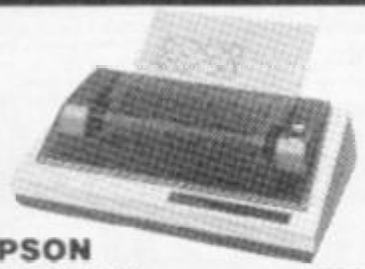

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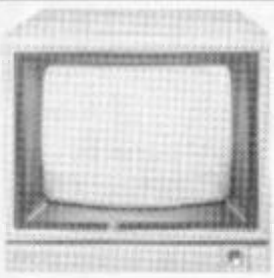

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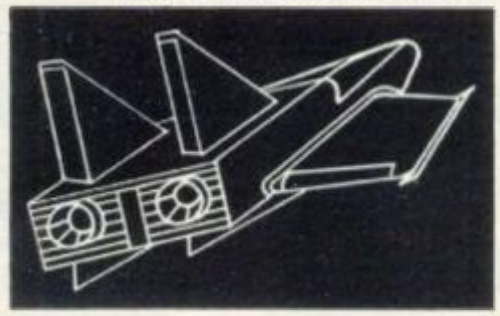

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GLOSSARY

Basic — Beginners' All-purpose Symbolic Instruction Code. A programming language resembling English which is used by beginners because most popular microcomputers have it as standard.

Bug — an error in a program.

EPROM — Erasable Programmable Read-Only Memory. Semi-permanent storage. Information is not erased if the power is turned off in the computer. Programs can be erased by subjecting the memory chips to ultra-violet light. The memory can then be re-programmed using an electrical device called an EPROM blower.

Interface — RS232 and Centronics. A device which enables other computers or add-ons, such as printers, to be connected to the computer. It converts non-standard signals from add-ons to the standard signals of the computer in use.

Kilobyte — (K). A measurement of memory size. Most machines use 16K as a minimum but 48K is generally agreed to be necessary for serious work.

Machine code — an electronic pulse code used by the computer to perform functions and communicate with memory and other devices.

Mnemonics — abbreviated instructions — for example LD for Load — used in machine language programming.

Motherboard — an external printed circuit board which is used like a multi-way plug planner. It enables other printed circuit boards, such as graphics boards and colour boards, to be slotted-in.

Port — a link to the outside world which can be used by programs and the computer.

PCB — printed circuit board. A board which has on it the electronic circuits of the computer.

RAM — Random Access Memory. Information and programs can be stored in this type of memory as electronic pulses which conform to a set of numbers — machine language — in which programs are represented in the computer. When the power is turned off the information will be lost.

ROM — Read Only Memory. Information stored in this type of memory is not lost when the power is switched off.

Software — programs which control the operation of the computer.

Syntax error — a bug caused by incorrect use of a programming language.

Our easy-to-follow guide for new owners

The basic route to a habit-forming hobby

BUYING a Sinclair machine can be the start of a life-time's obsession with home computing. It is easy, however, to become discouraged if everything does not go according to plan from the beginning.

For those with only a little knowledge of computers and their capabilities, the best way to approach the machines is to abandon any ideas for special uses. While the 48K Spectrum is big enough for simple uses in small businesses, the range of Sinclair computers does not contain machines for major uses. It is better to become accustomed to the many facilities and then decide how you wish to use them.

Begin by unpacking your machine, overcoming your surprise at its size and weight and, following the manual, set up the system. If you cannot get the K on the screen, check that everything is plugged into its correct socket and re-set the machine by pulling-out the power plug for one second and try tuning-in again. If still nothing appears, check the power supply unit by shaking it. If it rattles, return it. If it is satisfactory, check your system with that of a friend.

If you have a Spectrum you will have received an introductory booklet which explains what the computer can do and giving detailed instructions on how to set it up. Also included is a fault-finding guide.

Once the K appears you are ready to begin learning about your machine. It can prevent family arguments if you can afford a separate television set for your system. It also makes life easier if you find somewhere to leave your equipment set up permanently. You will find that a few power sockets are needed and a four-way block connector on a short length of extension cable will help to tidy trailing leads.

When using a Spectrum, a television set has to be more finely-tuned than when using a ZX-81 because of the added dimension of colour. If the set is not tuned properly, the colours will look hazy instead of sharp and clear. If no colour can be seen when it is switched on, the power supply or the television set may be at fault.

Some users have experienced some difficulty with some television sets, which include Hitachi, Grundig and Toshiba. Sets which many people have found compatible include the Sony Trinitron, Fidelity and Ferguson.

The manuals are written in great detail and are reasonably easy to follow. Some of the chapters may not seem immediately relevant but it is worthwhile reading them as you might miss something important.

Patience is needed at that stage to learn the ways in which the computer will accept information. It is tempting to try to enter programs before you are ready but that is likely to lead to errors. For example, words like AND, THEN and AT should not be typed-in letter by letter.

By the time you have reached chapter 11 in the ZX-81 manual and chapter 19 in the Spectrum manual you should have accumulated sufficient knowledge to be

continued on page 112

Starting from Scratch

continued from page 111

able to type-in other people's programs, such as those in *Sinclair User* and *Sinclair Programs*, without too much difficulty.

It is that important when using the ZX-81 that it is not jolted. Some of the connections can easily work loose and everything which has been entered will be lost.

The manuals are not to everyone's liking and if you find them difficult to follow a number of books on the market can help you. Find the one which suits you best.

As a way of relaxing you can buy some of the growing range of commercially-produced software. That can be loaded directly from cassette but make sure that your machine is big enough to take the tapes you buy.

For the ZX-81 there are a few tapes for the unexpanded 1K machine but the majority require the 16K RAM pack. Similarly on the Spectrum most companies are taking advantage of the possibilities provided by the larger 48K machine rather than providing cassettes for the 16K.

The tapes can vary in quality and it is advisable to read the reviews in *Sinclair User* and use your judgment to find the best.

An alternative method to learn about both the ZX-81 and the Spectrum is to plunge in at the deep end and see what the machines will do. Refer to the manuals when you have difficulties. You can ignore the functions and calculations initially and experiment with PRINT statements to obtain the feel of the machines.

You may already have heard about the problem involved in SAVEing and

LOADing your own cassettes. The manual gives detailed instructions but many of the early ZX-81s would not accept tapes from some recorders. That problem is said to have been overcome but there can still be difficulties.

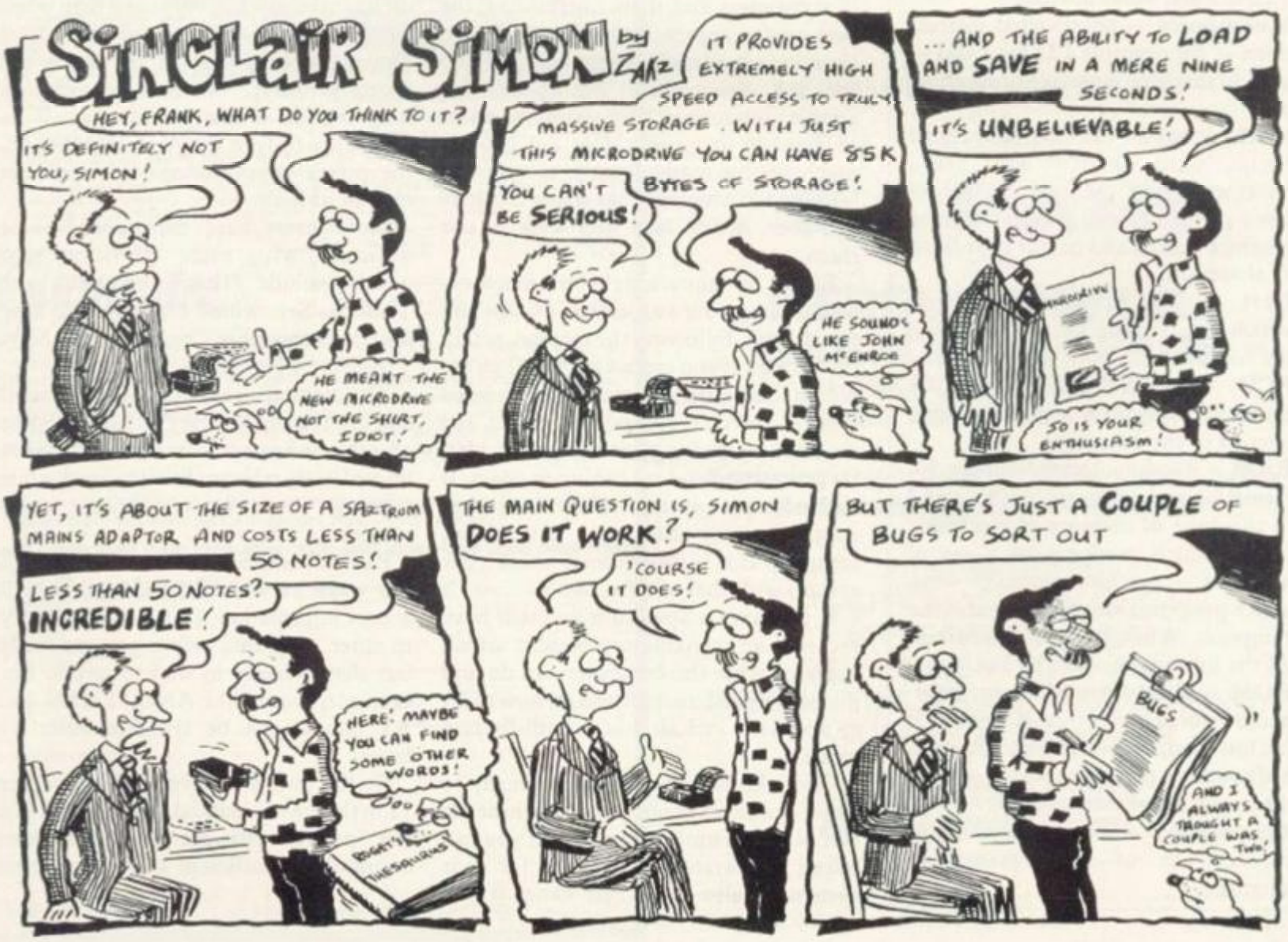
Usually they occur when LOADing tapes recorded by other people. One simple method to overcome this is to wind the tape to the middle of the program and type LOAD "" followed by NEWLINE; then increase the volume of the recorder slowly with the tape running until the television screen shows four or five thick black bands. If you then re-wind the tape, the program should LOAD normally.

LOADing and SAVEing on the Spectrum is much easier and faster than the ZX-81. One difference is that when SAVEing on the Spectrum the LOAD lead must be disconnected either at the recorder or the Spectrum.

Finally, a health warning. Apart from any practical uses, computing with your Sinclair machine can be a very entertaining hobby and is almost certainly habit-forming. You may easily find yourself crouched over your machine, red-eyed, in the early hours of the morning thinking that in another five minutes you will solve the problem. Try to break that habit by getting into the fresh air and meeting other Sinclair users.

By obtaining a Sinclair computer you find that you have joined a not very exclusive club with many thousands of members, many of whom would be only too happy to advise you if you have difficulties.

Make sure of your regular copies of *Sinclair User* and *Sinclair Programs* and you can be guaranteed many happy hours.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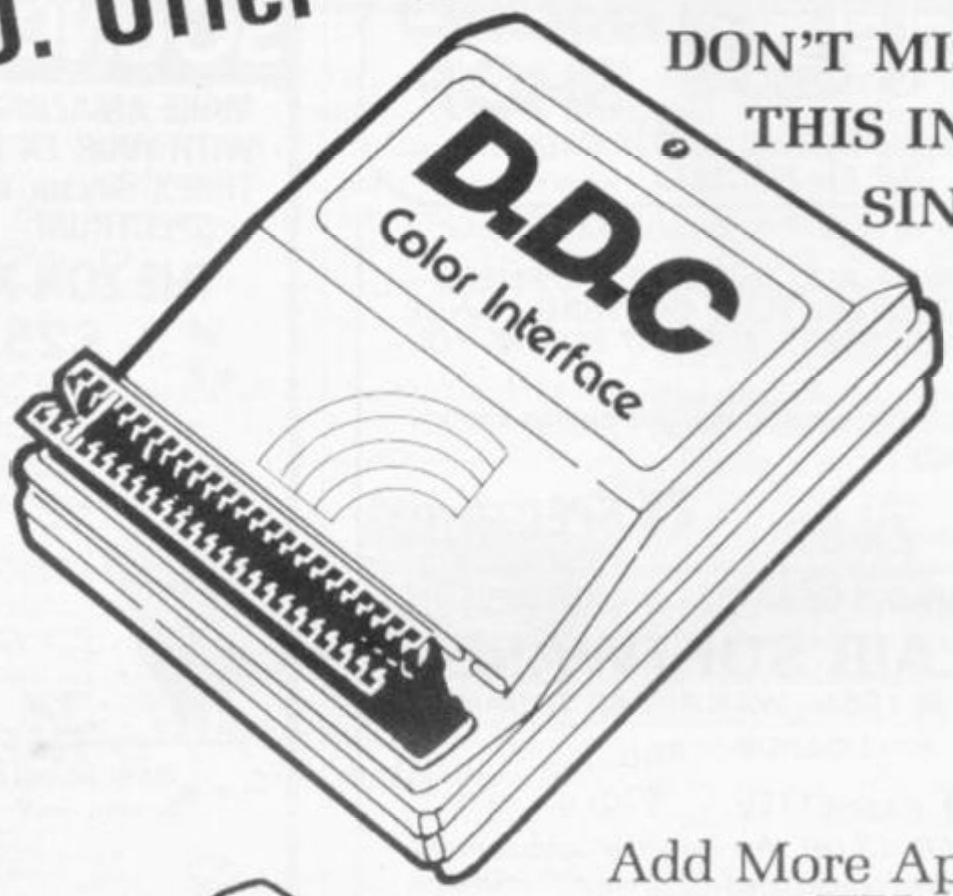

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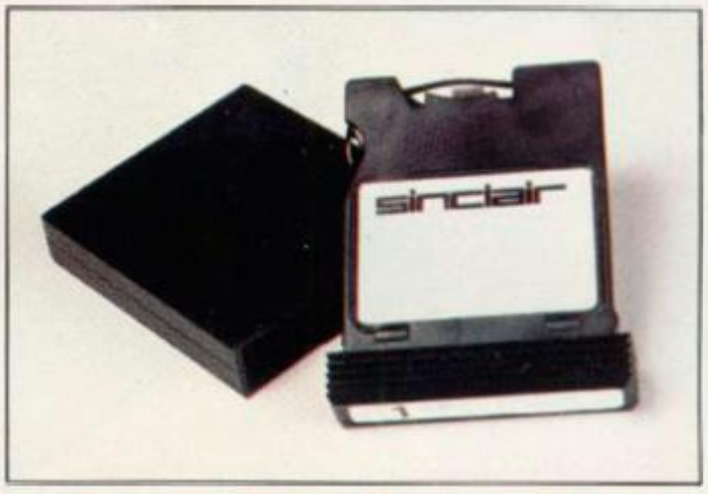

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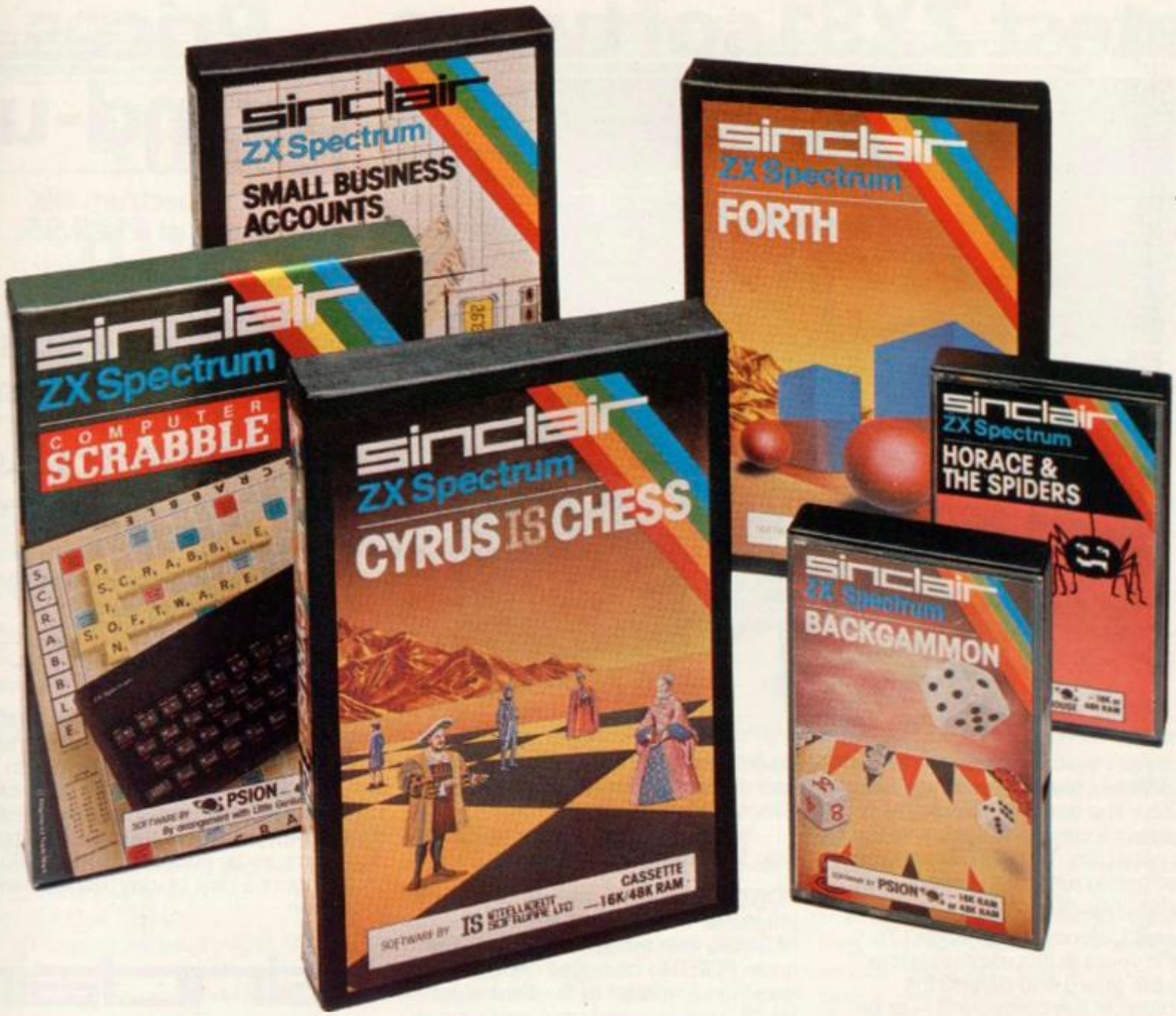

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Adults get good guide to mysteries of the micro

Many parents do not understand children's interest in computers. John Gilbert reviews a publication aimed at helping them

THE SPECTRUM and ZX-81 until now have been children's playthings so far as many parents are concerned. With the availability of a new book which aims to provide an introduction to computers for parents, that situation may change.

The book is *Kids and Computers, The Parents' Microcomputer Handbook,* by Eugene Galanter. It first takes an adult through the history of computing to explain why computers are so important and what effect they have in our lives.

The opening chapters state that if children are not computer literate to some degree they are illiterate as far as education in Britain is concerned. That is true to some extent and the author argues the case strongly in the chapters which follow.

He stresses the good points of using a computer. Using a keyboard will prepare a child for typing skills which may be required in later life. They will learn that the computer does not tolerate spelling mistakes in programs, so the child will have to spell correctly. The child must also solve problems in small, logical steps.

The book shows how the parent can become involved in the learning process without taking away the feeling of achievement from the child. There is even a computer development chart showing the average ages at which children assimilate computer skills. The learning process can start at about five years of age when the child becomes used to the keyboard and is able to locate characters on it.

It is an excellent introduction for parents who want to know why their children spend all their spare time in the bedroom in front of a computer keyboard and screen. It is available from Kingfisher Books and is an inexpensive hardback costing £5.95.

Fun Mathematics on your Microcomputer continues the educational theme. It is by Czes Kosniowski and aims to show that mathematics can be entertaining.

Some of the explanations are a little difficult to understand and the general style of the book would make it of more interest to college or university students than to schoolchildren or adults with only a rudimentary understanding of mathematics. That is a pity as many of the ideas of the author are of interest to anyone who owns a computer.

The most interesting chapters cover games playing and graphics. If you are interested in gaming strategy or how to draw three-dimensional shapes, the book is for you.

Kosniowski shows that almost every operation performed by a computer is in some way governed by numbers and that it is with equations and formulae that games and graphics are designed. The book, from Cambridge University Press, costs £4.95.

The Complete Programmer, by Mike James, is another book which professes to show the beginner the difference between good and bad programming practice. It is different from most of the others which seem to be written by people who know a good deal about theory but not so much about practice.

James makes no claim about being an expert in programming techniques, although he obviously is, and even stresses that there is no such thing as good programming technique, only preferred.

If a reader can tolerate the dense style of the author the text is guaranteed to increase knowledge of programming and therefore make programs easier and more fun to write. On top of that your programs will run faster than they used to do and the listings will be easier to understand.

The *Complete Programmer* is one book on 'better' programming technique which can be thoroughly recommended. James' style is slightly heavy-going and some of his arguments could be compressed from a page to a paragraph but the book is worth having as a reference or learning manual.

It costs £5.95 and can be obtained from Granada Publishing. It is slightly expensive but the information it contains is worth the extra money.

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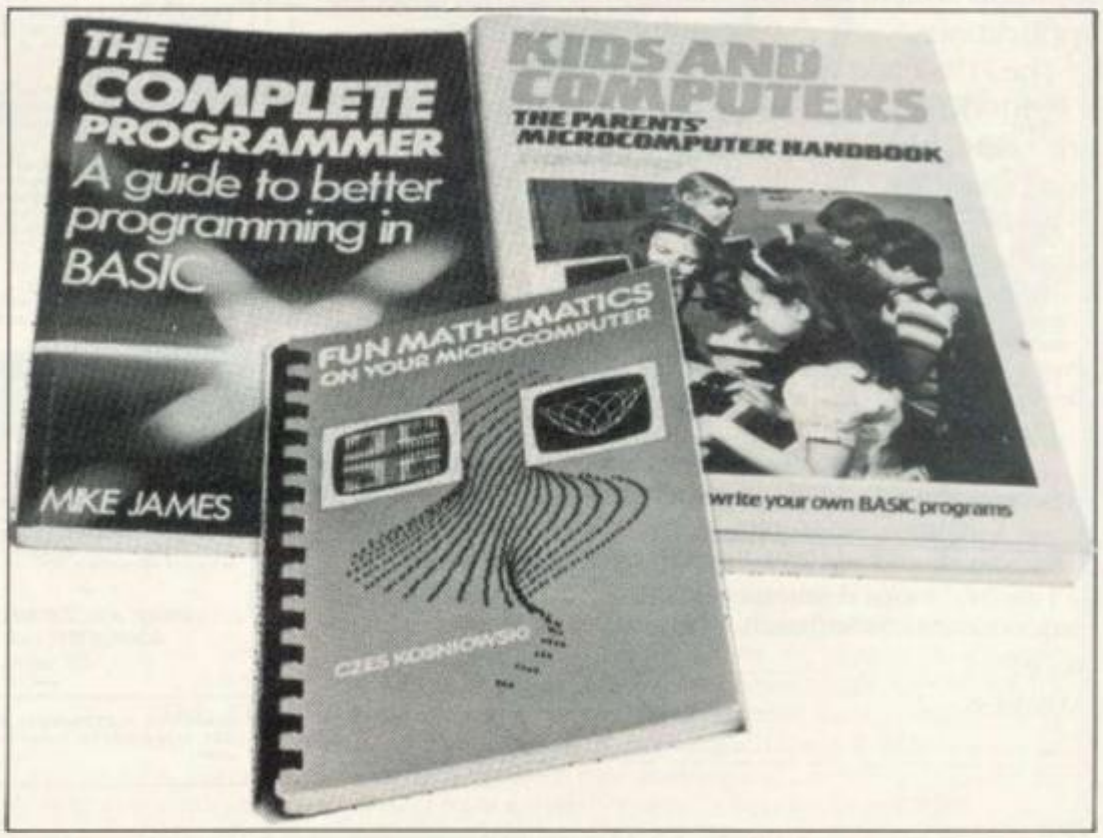

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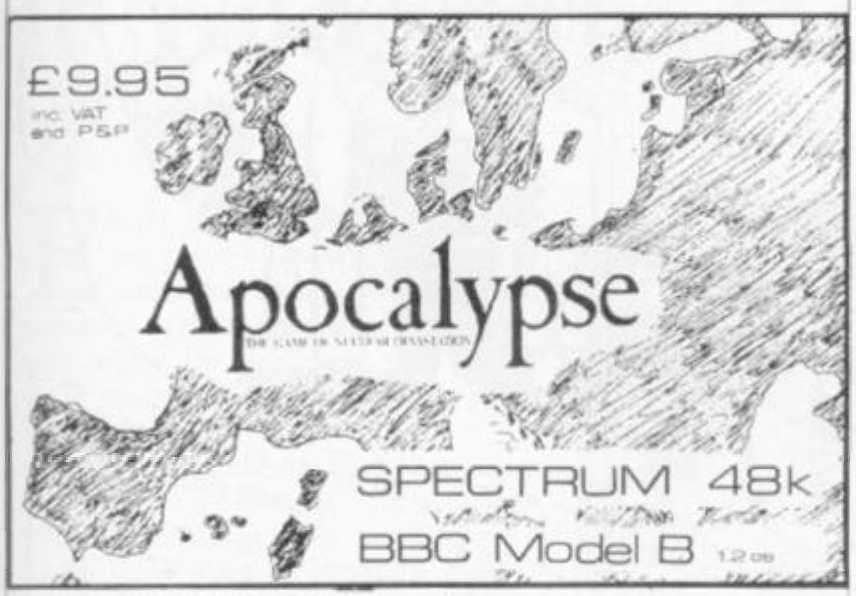

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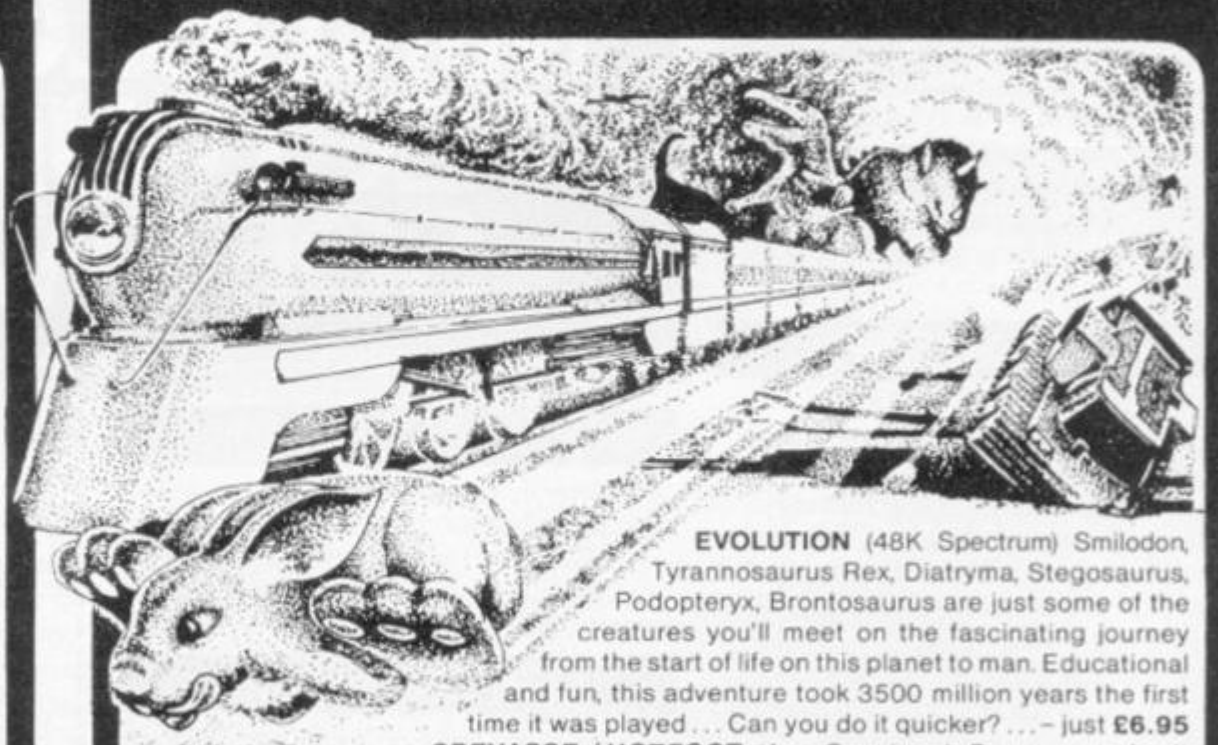

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Can you prevent the program being listed?

Andrew Hewson considers security and zero line numbers

EACH MONTH I re-read the latest batch of letters and note the contents. Then I decide which to answer in the magazine, trying to mix easy topics for beginners with something more substantial for the more advanced.

Despite summer weather there have been sufficient dedicated Sinclair users, red-eyed and finger-sore, scribbling feverish notes about desperately important problems to provide the usual mixture of easy, interesting, exacting, impossible and incomprehensible letters.

The first is from Chris Porton of Pinner, Middlesex. He writes: **Some games listings contain an O REM statement when listed. How do you obtain such a line number and can you prevent the rest of the program being listed, too?**

To answer the question I must first explain a little about how a program is held in the ZX-81 or Spectrum. To avoid confusion I shall explain the situation for the ZX-81 in detail and then outline the differences for the Spectrum.

The first diagram on page 171 of ZX-81 Basic Programming shows that the Basic program area starts at address number 16509. The following simple ZX-81 program PRINTs the contents of the first 20 locations in the Basic program area on the screen, i.e., it looks at the 20 locations starting at 16509:

```
10 FOR I=16509 TO 16528
20 PRINT I;TAB 8; PEEK I;TAB
   16;CHR$ PEEK I
30 NEXT I
```

If the computer memory is cleared before the program is entered, either by disconnecting the power supply temporarily or by entering NEW, the program area will contain the three program lines only. Thus when the program is RUN it will be looking at itself. The screen display will show, for example, that locations 16513 to 16520 contain the code for the command 'FOR' (235) followed by the codes for each of the seven characters I, =, 1, 6, 5, 0 and 9.

The first two bytes, 16509 and 16510, contain 0 and 10 respectively because those two bytes are used to specify the line number of the first line, the calculation being:

256 * first byte + second byte = line number.

Experiment by POKEing new numbers into those two locations and then LISTing the program to see the effect. Try, for example:

• *Please address problems and queries to Andrew Hewson, Helpline, Graham Close, Blewbury, Oxfordshire.*

```
POKE 16509,10
POKE 16510,27
LIST
```

It will be seen that the line number of the first line is then 2587 because

256 * 10 + 27 = 2587.

Notice that the order of the lines has not been changed and therefore it can be concluded that the ZX-81 has taken no action as a result of the interference with the contents of the program area. The program no longer works because the NEXT command in line 30 directs the ZX-81 to continue execution from the line following line 10. As line 10 no longer exists the program fails. Hence unless care is taken to avoid the use of FOR-NEXT loops and GOTO and GOSUB commands it is not possible to run a program with line numbers corrupted in that way. There are two tricks worth mentioning. Try entering:

```
POKE 16509,39
POKE 16510,10
LIST
```

The first line number will then be 9994 because 39 * 256 + 10 = 9994.

continued on page 124

Hex code	Assembler code	Comment
01 0A 00	LD BC,10	New first line number
2A 53 5C	LD HL, (PROG)	Beginning of program area
70	LD (HL),B	Insert new line
23	INC HL	number
71	LD (HL),C	
23	INC HL	
5E	LD E,(HL)	Load line length
23	INC HL	into DE
56	LD D,(HL)	
23	INC HL	
19	ADD HL,DE	Address of next line
E5	PUSH HL	Save address
ED 5B 4B 5C	LD DE,(VARS)	Address of end of program
A7	AND A	Clear carry flag
ED 52	SBC HL,DE	End?
30 09	JR NC,9	Jump if yes
21 0A 00	LD HL,10	No, step size is 10
09	ADD HL,BC	Increment line number
44	LD B,H	and store in BC
4D	LD C,L	
E1	POP HL	Retrieve address
18 E4	JR -28	Jump to continue
E1	POP HL	End
C9	RET	

Table 1. A program to re-number Basic programs on the Spectrum, excluding GOTOs and GOSUBs.

Helpline

continued from page 123

The largest line number allowed on Sinclair machines is 9999 so, it may be asked, what happens when an attempt is made to insert a bigger line number? To determine enter:

POKE 16509,40
LIST

The first line number is then shown as A250 whereas we would have expected it to be

40 * 256 + 10 = 10250.

Reference to the table of codes of the character set in appendix A of ZX-81 Basic Programming gives a clue to the situation. The table shows that the codes for the digits 0 to 9 are 28 to 37 respectively and they are followed by the codes for the letters of the alphabet. The ZX-81 is programmed to expect line numbers to contain at most four digits. When it finds a line number which should have five digits it uses a single letter from the beginning of the alphabet to represent the first two—A to represent 10, B to represent 11, C to represent 12.

Provided the line numbers are kept in order, programs can be written to use line numbers up to 16383—which appears as G383. Fortunately the machine will accept incorrect instructions like

GOTO 12530

which makes writing such programs easier than it would otherwise be.

Attempting to POKE in line numbers greater than 16383 causes the program display to disappear and so this is the answer to Porton's second question. To see this effect enter

POKE 16509,99

The program no longer functions although it is still present in memory as can be seen by entering

POKE 16509,0

The Spectrum is very similar to the ZX-81 in those features. The principal difference is that the program area does not start at a fixed location. The address is held in the PROG system variable which can be read by entering

PRINT PEEK 23635 + 256 * PEEK 23636

The result is normally 23655.

The Spectrum character codes are also different from those of the ZX-81, as can be seen by studying appendix A of ZX Spectrum Basic Programming.

Phil Jones of Carshalton writes: **Is there a simple machine code line re-number program which also re-numbers GOTOs for the Spectrum? I have seen two in magazines but they are too complicated for me to understand.**

The short answer is no, but I can help by explaining the various tasks which must be executed by the routine. Enter and RUN the following program which looks at the Spectrum program area:

```
10 FOR I=23755 TO 23800
15 PRINT I;TAB 8;PEEK I; TAB
   16;CHR$ PEEK I
20 NEXT I
```

Locations 23755 and 23756 contain 0 and 10, thus specifying the line number of the first line. Locations 23759 to 23766 inclusive contain the codes FOR,I,=,2,3,7,5 and 5 but in between there are locations 23757 and 23758. They contain 27 and 0 and in doing so they specify the length of the remainder of the line. The calculation is

first byte + 256 * second byte = line length
i.e., 27 + 256 * 0 = 27.

Hence the line ends at location 23758 + 27 = 23785 as can be seen by allowing the Spectrum display to scroll on and noting that location 23785 contains the ENTER character code (13) and is followed by two bytes containing 0 and 15 forming the line number of the second line.

Armed with that information it is reasonably easy to write a program to re-number only the line numbers of a Basic program. An example is shown in table one. To load the program enter and RUN the Basic hex loader listed in table two and then enter each pair of hex codes given in table one in turn. On completion, enter S to stop the Basic program.

The re-number program can be executed by entering

RAND USR 23296

If the program has been loaded correctly the Basic program will be re-numbered using a stepsize of 10, not five as shown in the original listing.

A program to re-number GOTO and GOSUB commands as well as program lines would need to execute the following steps:

Reserve some space in memory as a working area.

Identify each GOTO and GOSUB in the program and store its address and destination label in the working area.

Re-number each line in turn, checking the old line number against the destination labels in the working area.

Whenever a match is found, convert the new number to character form and over-write the character form of the destination label.

If the new and old labels differ in character length, extend or contract the entire program area to accommodate the difference. For example, if the old label were 95 and the new one 140 the program area would have to be made one byte longer. Update the addresses held in the working area appropriately.

Convert the new line number to floating point form and over-write the numerical form of the destination label held in the program area.

Delete the entry in the working space so that labels are not re-numbered erroneously more than once.

Clearly the code to undertake those tasks must be sophisticated. Some ROM routines can be used—to convert numbers from character to numeric form, for example—but a suitable routine is nonetheless likely to be 400 to 500 bytes long.

```
 5 FOR I=23296 TO 23551
10 INPUT Z$
15 IF Z$="S" THEN STOP
20 PRINT Z$;" ";
25 LET Z$(1)=CHR$ (CODE
   Z$(1)-7*(CODE Z$(1)>57))
30 LET Z$(2)=CHR$ (CODE
   Z$(2)-7*(CODE Z$(2)>57))
35 POKE I,16*CODE Z$(1)+CODE
   Z$(2)-816
40 NEXT I
```

Table 2. Spectrum program to load pairs of hexadecimal codes into the printer buffer.

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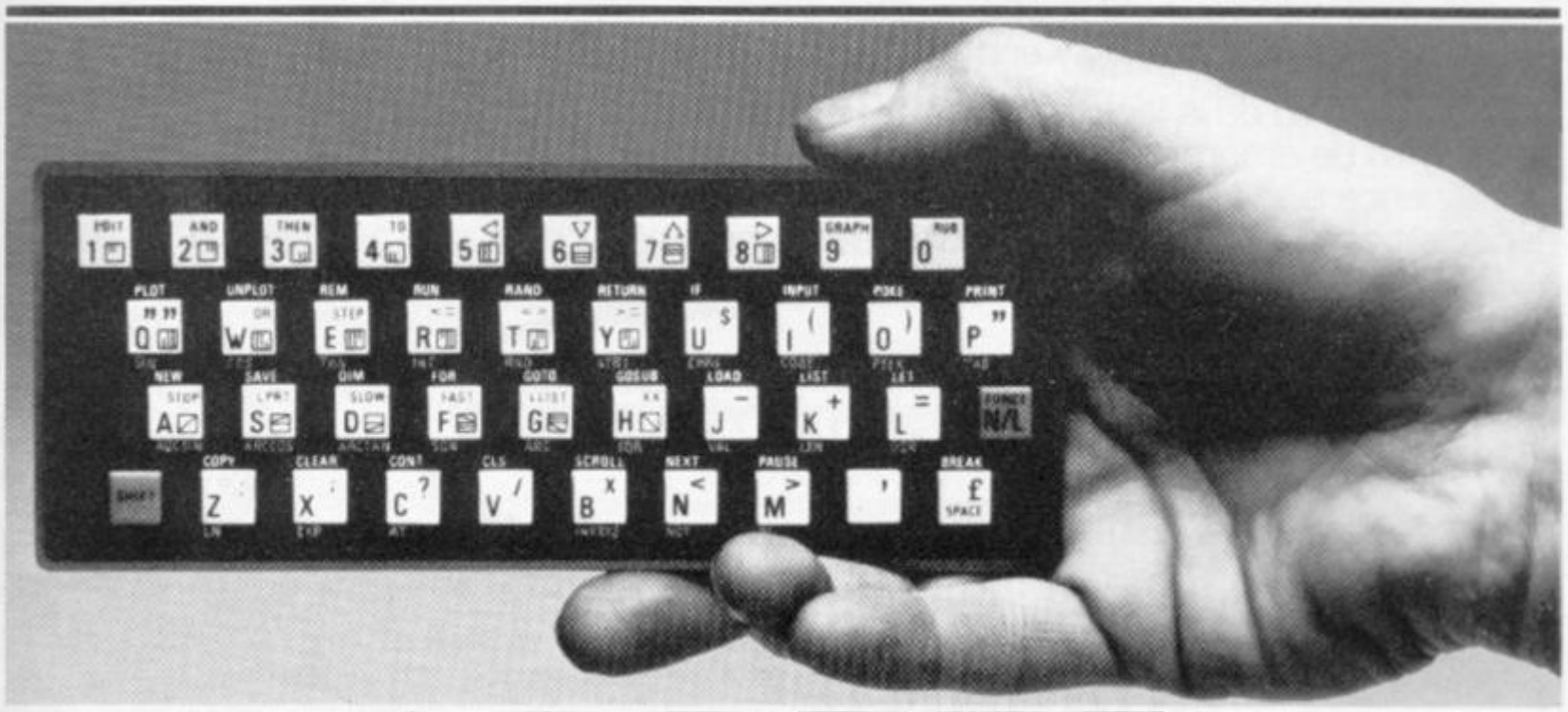

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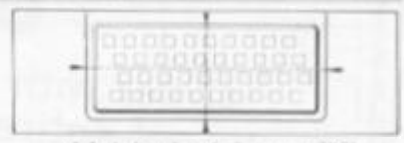
3. So all you do is remove the protective backing.



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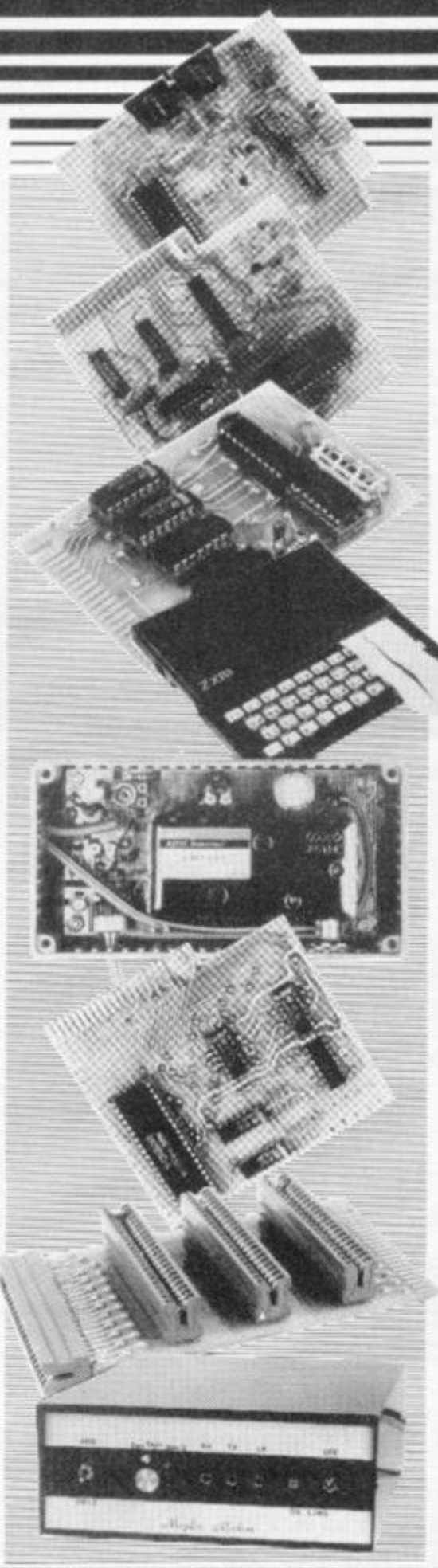

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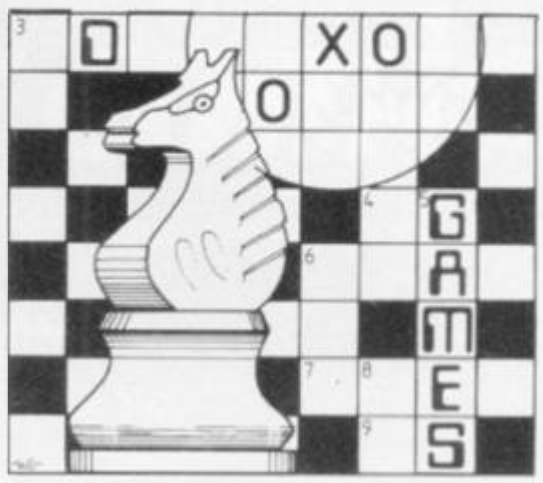

THE CONCEPT of an animated adventure is reasonably new. Such a package is distinct from an adventure like The Hobbit or Planet of Death, because all the action takes place in graphics form. There is little or no text with this type of adventure.

There are only two graphics adventures which stand out in the market at the moment. The first to be produced was **Black Crystal** from Carnell Software. The company produced a version of the game for both the ZX-81 and Spectrum.

The adventure is loaded in several sections because of its memory requirements. Each section puts the user into a different scenario. For instance, the first part displays an overhead view of a fantasy land in which the game is taking place. In that land you have to find the rings which, when brought together, will destroy the evil black crystal.

To find all the rings the player must go through forests and castles to reach the tower room where the black crystal has its domain.

When I first started to play the game the rings seemed to be scattered randomly around the map. Soon I found that several of the rings could be detected in the forest area of the map every time I went back to the program.

When I had found all the rings on map one I entered the castle in the middle of the map. There are several levels to the castle and on the lowest I found an invisibility charm which helped me to evade the ghouls which plagued me continually.

Another difficulty which you may find on level two of the castle is the mist which can damage your health seriously. The best way to disperse it is by using your power drain.

When moving round the castle it is best to keep your finger on the 'swerve' key. That will use some of your energy but you will avoid some of the nastier aspects of the monsters when they strike at you. To get to each map of the game you have to know the code numbers which have been given to you from the previous map. I have several of them but if any readers have discovered the last two I would be interested to hear.

Black Crystal is a Basic program and as a result the game movement routines are slow. The second graphics adventure to reach the market is **Halls of the Things** and, despite its awful title, it is very fast to play.

It is written in machine code and is the first graphics adventure for which I would recommend a joystick. The action centres on a maze of seven levels. Each level can be reached by moving up a staircase on the right of the maze.

As with Black Crystal, the object of your quest is to find the rings of power but to do that you must kill as many of the Things as you can. To do so you have a bow and arrow, lightning bolts which may rebound on you, and magical firebolts. The monsters are also equipped with those weapons and if you are hit by one of them your strength is sapped.

To regain your magical strength you must drink as much as you can of the milk which is lying around the maze. That part of the game is not stressed in the documentation with the package, as the authors believe that players should find their own ways to survive.

One of the most important tips which I picked up during play was that you should have your finger on the fireball key when you enter a section of the maze from the stairway. When you get into the maze you will not be able to see all the monsters which are approaching you. A fireball will be produced if the monster is in your vicinity, so when you see that flame flare you should beware of the Things.

The fireball is the easiest weapon to use, so at some point in the game you will be tempted to use it all the time. Unfortunately that weapon is also the most costly in terms of magical strength. If you have time you should try to use your bow and arrow.

The bow is the most difficult of the weapons to use as the Things will often surprise you and launch a quick attack even before you have your bow stringed. To fire an arrow you must indicate in which direction you want it to fly and then press the arrow release key. Several shafts can be fired at one time if the need arises.

The mazes which are created in Halls of the Things are set randomly but the game is easier to play in some parts of the maze than in others. The upper levels are the easiest to play in because there are fewer narrow corridors and more open spaces in which to see monsters coming. The expert, however, will find many things to tax the brain in the lower part of the maze.

HINTS AND TIPS

Halls of the Things

When entering you will be amazed,
Just fire a quick blast to start a blaze;
With lower levels you have more chance,
Above those monsters will lead you a dance;
All that glitters is not gold,
The wall's one place to metamorphose.

Black Crystal

Castle stairs,
In wall-like snares;
Where weapons are concerned,
The means to an end are always appropriate.

● *If you have any views on mind games or if you have hints and tips on adventure, computer-moderated games or chess, please write to me:*
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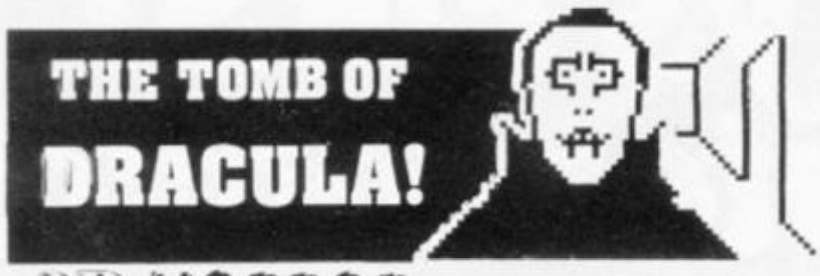

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SOFTWARE DIRECTORY

THIS MONTH *Sinclair User* begins a new service to readers – a software directory. Starting with this issue and continuing in future issues we will be publishing a list of all the software of which we know on the Sinclair market, with the machine on which it should be played, the publisher and the type of program.

If we have reviewed a cassette we shall give it a rating known at the Gilbert Factor, named after our software reviewer John Gilbert. Although the final figure is out of 10 it is the result of a complicated calculation involving a number of factors which are taken into account when assessing how good a cassette is.

The factors include value for money, the layout of the screen instructions, conciseness of the program and its speed of operation, the accomplishment of the task it aims to achieve, the innovation of concept, and the use it makes of the machine.

While trying to ensure that all software is dealt with it is inevitable that some will be omitted. We will remedy any omissions later. Lack of space means that we cannot publish the complete list in one issue. The remainder of the list will be published next month and we will repeat this month's one month later.

Any suggestions for its improvement will be welcomed.

Name	Machine	Company	Type	Gilbert factor
Accounts (Sole Trader)	48K Spec.	Hestacrest	Business	*
Accounts (Limited Company)	48K Spec.	Hestacrest	Business	*
Accounts (Sole Trader)	16K ZX-81	Hestacrest	Business	*
Accounts (Limited company)	16K ZX-81	Hestacrest	Business	*
Address Manager	48K Spec.	OCP	Business	7
Adventure 1	48K Spec.	Abersoft	Adven.	6
Adventure 1	16K ZX-81	Abersoft	Adven.	6
Airline	16K ZX-81	CCS	Sim.	*
Airline	48K Spec.	CCS	Sim.	*
Air Traffic Controller	16K Spec.	Hewson	Sim.	6
Alien Dropout	16K ZX-81	Silversoft	Arcade	*
Allsort S–1	48K Spec.	A Firminger	Utility	7
Alphabet	16K Spec.	Widget	Education	*
Arcadia	16K Spec.	Imagine	Arcade	5
Arcadian	16K Spec.	J K Greye	Arcade	*
Aspect	16K Spec.	Bug Byte	Utility	5
Assembler	48K Spec.	Artic	Utility	6
Asteroids	16K ZX-81	Silversoft	Arcade	*
Asteroids	16K ZX-81	Software Farm	Arcade	6
Astrology	16K Spec.	Stellar Servs.	Utility	7
Astrology	16K ZX-81	Stellar Servs.	Utility	*
Audio Sonics	16K Spec.	Work Force	Utility	4
Auto Chef	16K Spec.	CCS	Sim.	*
Auto Chef	16K ZX-81	CCS	Sim.	*
Avenger	16K Spec.	Abacus	Arcade	*
Backgammon	48K Spec.	CP	Mind Game	*
Backgammon	16K Spec.	Hewson	Mind Game	*
Bank Account Syst.	48K Spec.	K Gouldstone	Business	8
Bank Raid	16K ZX-81	J M Senior	Game	*
Barrow Quest	16K ZX-81	Sherry	Adven.	*
Base Invaders	48K Spec.	Work Force	Arcade	6
Battle of Britain	48K Spec.	Microgame	Strat.	*
Battleships	16K ZX-81	JRS	Strat.	*
Beamscan	48K Spec.	Hilderbay	Utility	*
Beamscan	16K ZX-81	Hilderbay	Utility	*
Big Match Soccer	16K Spec.	Winters	Strat.	*
Biorythms/Pyramids of Egypt	16K Spec.	Spectrasoft	Game	*
Black Crystal	48K Spec.	Carnell	Adven.	7
Black Crystal	16K ZX-81	Carnell	Adven.	7
Black Dwarf's Lair	48K Spec.	Newsoft	Adven.	*
Black Hole	16K Spec.	Quest	Arcade	6
Blind Alley	16K Spec.	Sunshine	Arcade	7
Brewery	48K Spec.	P Boulton	Strat.	*
Bridge Tutor	16K Spec.	CP	Mind Game	*
Business Bank Account	48K Spec.	Transform	Business	*
Business Bank				
Children's Compendium	16K Spec.	Dymond	Game	*
Collector's Pack	48K Spec.	Sinclair	Business	7
Colossal Caves	48K Spec.	CP	Adven.	*
Compiler	48K Spec.	Softek	Utility	6
Conflict	48K Spec.	Martech	Strat	*
Conflict	16K ZX-81	Martech	Strat	7
Countries of the World	16K Spec.	Hewson	Utility	8
Cosmic Guerilla	16K Spec.	Crystal Comp	Arcade	8
Cosmos	16K Spec.	Abbex	Arcade	7
Copycat	1K ZX-81	Copycat	Utility	*
Counting	16K Spec.	Starter Soft	Education	*
Counting	16K Spec.	Widget	Education	*
Crevasse and Hotfoot	16K Spec.	Microsphere	Games	7
Critical Path Analysis	48K Spec.	Hilderbay	Business	*
Critical Path Analysis	16K ZX-81	Hilderbay	Business	6
Cruising	16K Spec.	Sunshine	Arcade	4
Cyber Rats	16K Spec.	Silversoft	Arcade	7
Cycle Planner	16K Spec.	Medidata	Utility	4
Dallas	16K Spec.	CCS	Sim.	6
Dallas	16K ZX-81	CCS	Sim.	6
Database	48K Spec.	Microl	Business	7
Demolition	16K ZX-81	Comp. Rntls.	Game	*
Derby Day	48K Spec.	Comp. Rntls.	Game	*
Destroyer	16K Spec.	Winters	Game	*
Dictator	16K Spec.	Bug-Byte	Strat.	*
Dietron	16K Spec.	Custom	Utility	6
Disassembler	16K Spec.	dK' Tronics	Utility	7
Display	16K Spec.	Work Force	Utility	*
DIY Book-keeping	48K Spec.	RAMTOP	Business	*
Do Not Pass Go	48K Spec.	Work Force	Strat.	6
Do Not Pass Go	16K ZX-81	Work Force	Strat.	*
Draft	16K ZX-81	Myrmidon	Business	*
Draughts	48K Spec.	CP	Mind Game	*
Dungeons of Doom	16K ZX-81	Woosoft	Adven.	*
Dungeon Master	48K Spec.	Crystal Comp.	Adven.	8
Dymonoids	16K Spec.	Dymond	Game	*
Editor/Assembler	16K Spec.	Picturesque	Utility	8
Educational	16K Spec.	Startersoft	Education	*
Engine Diagnostic	48K Spec.	Spectrasoft	Utility	*
Escape	16K Spec.	New Generation	Maze	8
Espionage Isl.	48K Spec.	Artic	Adven.	5
Espionage Isl.	16K ZX-81	Artic	Adven.	*
Ext	48K Spec.	Abbex	Arcade	6
Everest Ascent	48K Spec.	Shepard	Adven.	6
Evolution	48K Spec.	Microsphere	Game	*
Family Games Pack	16K Spec.	Hornby	Game	*
Farmer	16K Spec.	CCS	Sim.	*
Farmer	16K ZX-81	CCS	Sim.	*
Galaxy Conflict	48K Spec.	Martech	Strat.	*
Account	16K ZX-81	Transform	Business	*
Caterpillar	16K Spec.	CDS	Arcade	*
Calpac 1	16K Spec.	Calpac	Education	*
Calpac 2	16K Spec.	Calpac	Education	*
Calpac 3	16K Spec.	Calpac	Education	*
Calpac 1	16K ZX-81	Calpac	Education	*
Calpac 2	16K ZX-81	Calpac	Education	*

continued on page 134

Cassette Round-up

continued from page 133

Name	Machine	Company	Type	Gilbert factor
Galaxy Conflict	16K ZX-81	Martech	Strat.	8
Gangsters	48K Spec.	P Boulton	Strat.	*
Gambling Tape	16K Spec.	Dymond	Game	*
Games 2	16K ZX-81	JRS	Game	*
Games Tape 1	1K ZX-81	J K Greye	Game	*
Games Tape 2	16K ZX-81	J K Greye	Game	*
Games Tape 3	16K ZX-81	J K Greye	Game	*
Games Pack 1	16K Spec.	A Burnham	Game	*
Games Tape 1	16K Spec.	Sospan	Game	*
Games Tape 2	16K Spec.	Sospan	Game	*
Games	16K ZX-81	P Teakle	Game	*
Ghost Hunt	16K Spec.	PSS	Arcade	*
Gobble-a-Ghost	16K Spec.	CDS	Arcade	*
Golf	16K Spec.	R & R	Sim.	7
Golf	16K Spec.	Virgin	Sim.	8
Gobbleman	16K Spec.	Artic	Arcade	*
Gobbleman	16K ZX-81	Artic	Arcade	*
Gobbler	16K ZX-81	Software Farm	Arcade	*
Gorilla	16K Spec.	D Hornsby	Game	*
Gnasher	16K Spec.	R & R	Maze	8
Graphics	16K ZX-81	IPA	Utility	*
Graphics Toolkit	16K ZX-81	JRS	Utility	9
Great Britain Ltd	48K Spec.	Hessel	Strat.	7
Great Britain Ltd	16K ZX-81	Hessel	Strat.	*
Greedy Gulch	16K ZX-81	Phipps	Adven.	7
Ground Attack	16K Spec.	Silversoft	Arcade	6
Ground Force Zero	16K Spec.	Titan	Arcade	*
Gulpman	16K Spec.	Campbell	Arcade	*
Gulp 2	16K ZX-81	Campbell	Arcade	*
Halls of Things	48K Spec.	Crystal Comp.	Adven	9
Heathrow	16K Spec.	Hewson	Sim.	8
High Noon	48K Spec.	Work Force	Arcade	9
High-resolution Graphics	1K ZX-81	P Moody	Utility	*
High-resolution Invaders	16K ZX-81	Odyssey	Arcade	*
Hitch Hikers' Guide to the Galaxy	48K Spec.	ESP	Adven.	6
Hobbit	48K Spec.	Sin/M. Hse.	Adven.	9
Horace and the Spiders	16K Spec.	Sinclair	Arcade	8
Horace Goes Skiing	16K Spec.	Sinclair	Arcade	8
Hungry Horace	16K Spec.	Sinclair	Arcade	8
Inca Curse	48K Spec.	Sinclair	Adven.	6
Inca Curse	16K ZX-81	Sinclair	Adven.	*
I Ching	48K Spec.	Sirius	Game	*
Inkos	48K Spec.	Chalksoft	Sim.	*
Integration	16K Spec.	University	Utility	8
Integration	16K ZX-81	University	Utility	8
Intermediate English 1	16K Spec.	Rose	Educ.	*
Intermediate English 1	16K ZX-81	Rose	Educ.	*
Intermediate English 2	16K Spec.	Rose	Educ.	*
Intermediate English 2	16K ZX-81	Rose	Educ.	*
Intermediate Maths 1	16K Spec.	Rose	Educ.	*
Intermediate Maths 1	16K ZX-81	Rose	Educ.	*
Intermediate Maths 2	16K Spec.	Rose	Educ.	*
Intermediate Maths 2	16K ZX-81	Rose	Educ.	*
Faust's Folly	16K Spec.	Abbex	Adven.	6
Fighter Pilot	16K ZX-81	Digital Int.	Sim.	5
Finance Manager	16K Spec.	OCP	Business	9
Flight Sim.	48K Spec.	Sinclair	Sim.	6
Flight Sim.	16K ZX-81	Sinclair	Sim.	6
Football	16K Spec.	Winters	Sim.	*
Football Manager	48K Spec.	Addictive Gms.	Sim.	7
Football Manager	16K ZX-81	Addictive Gms.	Sim.	*
Forth	48K Spec.	Abersoft	Lang.	9
Forth	48K Spec.	Sinclair	Lang.	7
Forth	16K ZX-81	Sinclair	Lang.	7
Four Rules of Number	16K Spec.	Micro Master	Education	*
Four Rules of Number	16K ZX-81	Micro Master	Education	*
Froggy	16K ZX-81	DJL	Arcade	7
Froggy	16K Spec.	DJL	Arcade	7
Fruit Line	16K Spec.	P A Hanson	Game	*
Fruit Machine	16K Spec.	dK' Tronics	Game	6
Full-screen Breakout	1K ZX-81	New Generation	Arcade	*
Galaxians	16K Spec.	Artic	Arcade	6
Galaxian 5	16K Spec.	Abbex	Arcade	*
Invaders	16K ZX-81	Abersoft	Arcade	*
Invaders	16K ZX-81	Bug Byte	Arcade	*
Invaders	16K ZX-81	Silversoft	Arcade	*
Invasion Force	16K Spec.	Artic	Arcade	8
Jackpot	48K Spec.	Comp. Rntls.	Arcade	*
Johnny Reb	48K Spec.	Lothlorian	Sim.	*
Keysounder	16K Spec.	S and G	Utility	*
The Key	16K Spec.	Keysoft	Utility	*
Knight's Quest	48K Spec.	Phipps	Adven.	6
Knight's Quest	16K ZX-81	Phipps	Adven.	*
Krackit	16K Spec.	Artic	Adven.	4
Krackit	16K ZX-81	Artic	Adven.	4
Labyrinth	16K Spec.	Axis	Arcade	4
Language Devel. Series	16K Spec.	Glasson	Educ.	*
Language Devel. Series	16K ZX-81	Glasson	Educ.	*
Language Devel. Series	16K ZX81	Micro Master	Educ.	*
Language Devel. Series	16K Spec.	Micro Master	Educ.	*
Leap Frog	16K Spec.	CDS	Arcade	*
Linear Progging	16K Spec.	University	Utility	*
Linear Progging	16K ZX-81	University	Utility	*
Lost Island	16K ZX-81	JRS	Adven.	*
Machine Code Test Tool	16K Spec.	OCP	Utility	7
Machine Code Test Tool	16K ZX-81	OCP	Utility	*
Mad Martha	48K Spec.	Miko-Gen	Adven.	7
Magic Mountain	16K ZX-81	Phipps	Adven.	*
Mailing List	16K ZX-81	Hestacrest	Business	*
Masterfile	48K Spec.	Campbell	Business	8
Masterfile 16	16K Spec.	Campbell	Business	*
Matcalc	16K Spec.	Work Force	Utility	*
Matrix Operations	16K ZX-81	University	Utility	7
Matrix Operations	16K Spec.	University	Utility	7
Maths Tutor	16K Spec.	AD Software	Educ.	*
Maze Chase	16K Spec.	Hewson	Arcade	8
Maze Death Race	48K Spec.	PSS	Arcade	*
Maze Death Race	16K ZX-81	PSS	Arcade	*
Maze Man	16K ZX-81	Abersoft	Arcade	*
Mazogs	16K ZX-81	Bug Byte	Arcade	*
MCoder	16K Spec.	PSS	Utility	*
MCoder	16K ZX-81	PSS	Utility	*
Merchant of Venus	16K ZX-81	Crystal	Adven.	7
Meteoroids	16K Spec.	dK' 'Tronics'	Arcade	*
Meteoroids	16K Spec.	Softek	Arcade	6
Meteor Storm	16K Spec.	Quicksilva	Arcade	7
Mined Out	16K Spec.	Quicksilva	Arcade	7
Mines of Saturn/ Return to Earth	16K Spec.	Mikro-Gen	Adven.	*
Muncher	16K Spec.	Silversoft	Arcade	*
Muncher	16K ZX-81	Silversoft	Arcade	*
Namtir Raiders	16K ZX-81	Artic	Arcade	8
Night Gunner	16K ZX-81	Digital	Sim.	5
NightFlite	16K Spec.	Hewson	Sim.	5
Nowotnik Puzzle	16K Spec.	Phipps	Game	7
Nowotnik Puzzle	16K ZX-81	Phipps	Game	*
Odds-on	16K Spec.	RSD	Game	*
O Level Chemistry	48K Spec.	Calpac	Educ.	*
O Level Chemistry	16K ZX-81	Calpac	Educ.	*
O Level French Revision	16K ZX-81	Rose	Educ.	*
O Level Maths Revision	16K ZX-81	Rose	Educ.	*

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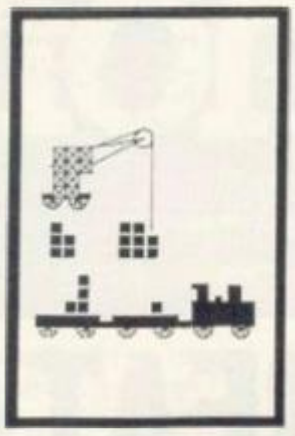

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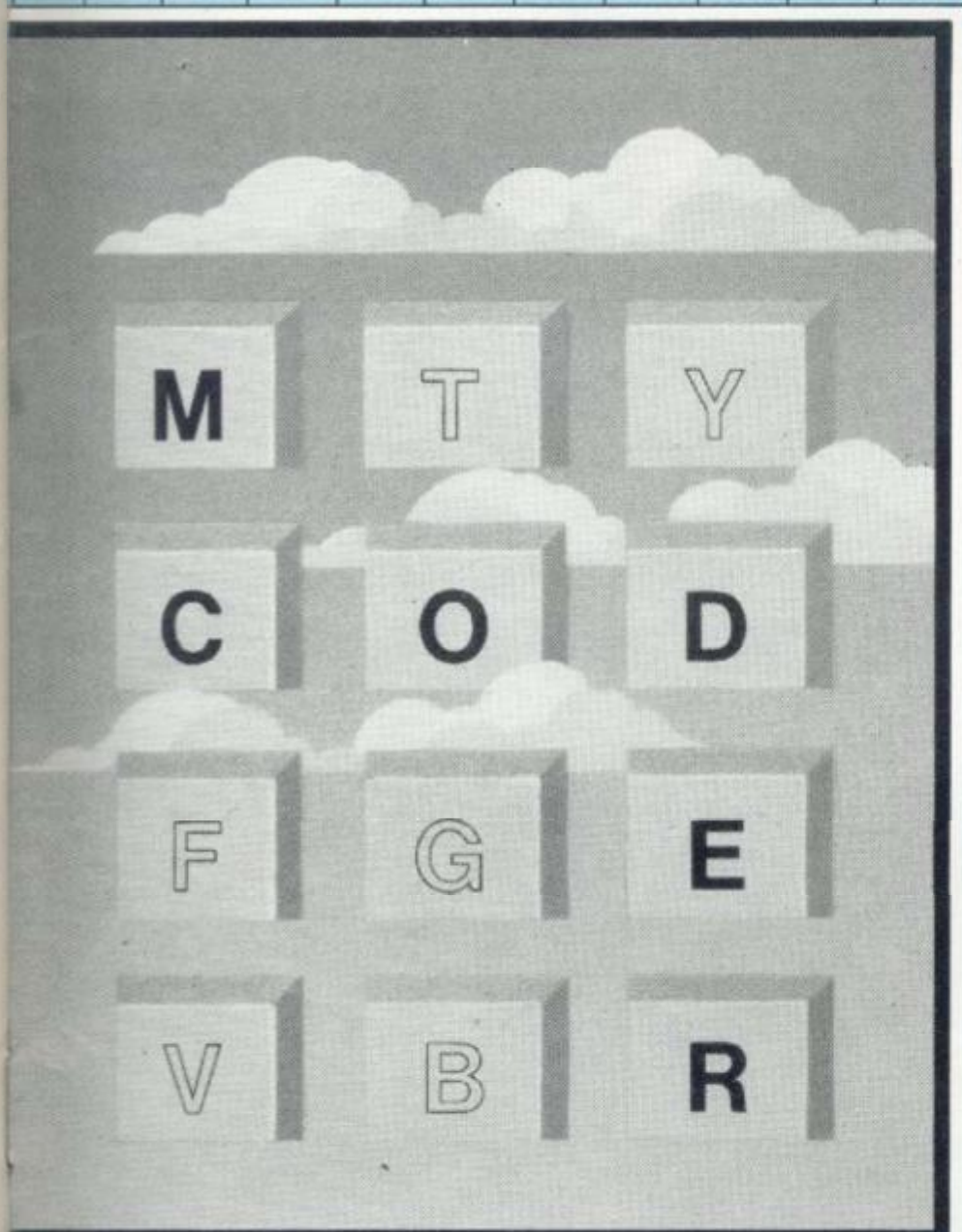

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